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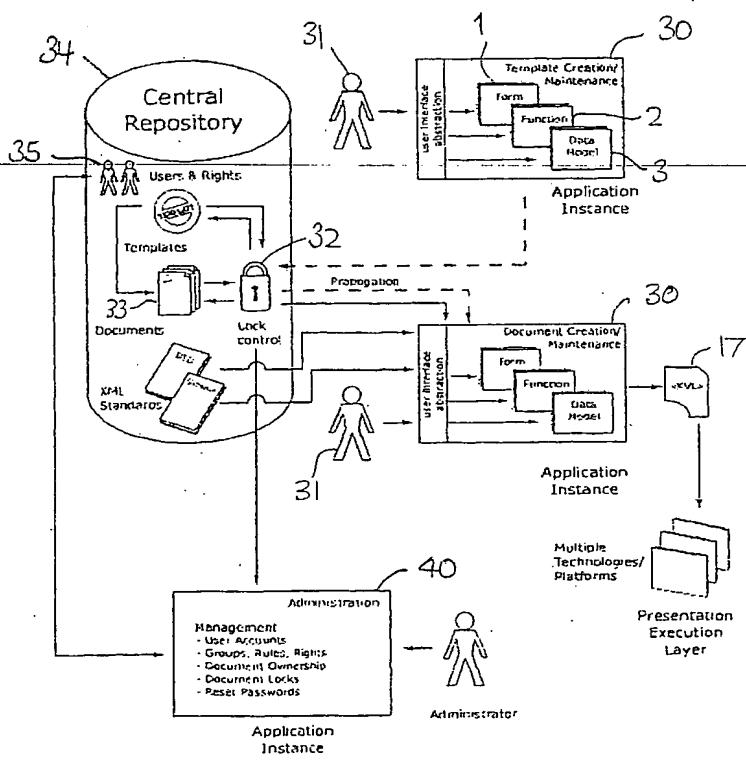
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(54) Title: ELECTRONIC DATA CAPTURE AND VERIFICATION



(57) Abstract: Apparatus for automatically building an electronic form for presentation to a user during a data capture process segregates the data capture intent behind the form from the presentation and execution of the form to a data capture user. In this way, the data capture process, including generation of the form and display of user input prompts, can be carried out on any computing platform independent of the system used to generate a data capture definition file that specifies the intent of the data capture requirements. The specification of data elements required during data capture, each having a type specification and a logical relationship relative to other data elements in a hierarchical structure are defined in a data capture definition file in a predetermined format. A data capture process executes the data capture definition file and automatically generates a plurality of visual displays for presentation to a user, each input screen comprising a plurality of user input areas corresponding to the data elements and physically positioned on the screen in a manner corresponding to the defined logical hierarchical structure.

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ELECTRONIC DATA CAPTURE AND  
VERIFICATION

The present invention relates to methods and apparatus for enabling  
5 electronic capture of data input by a user and data exchange between  
systems. In particular, the invention relates to methods and apparatus for the  
automatic generation and presentation of forms for display on a computer  
monitor, which forms guide and prompt a user to enter data into appropriate  
fields in the displayed form. The invention further relates to methods and  
10 apparatus for automatically testing the data being input for compliance with  
predetermined validation criteria, and rule-based determination of  
subsequent action (such as determination of the nature of a subsequent  
screen display) based on the data input. The invention further relates to  
methods and apparatus that can be used in data exchange between systems  
15 whereby validation criteria and rule based actions can be applied during data  
exchange.

Many organisations throughout industry and commerce, such as banking,  
insurance, finance, healthcare etc, have a common requirement to receive  
20 and process complex data relating to individual customers that they serve.  
For example, insurance organisations need to capture large quantities of  
personal information from individuals, which information include names,  
addresses, ages, personal circumstances, lifestyle details, health details,  
insurance cover requirements, and so on. Conventionally, the most  
25 convenient way to do this has been by the use of forms, which can be  
presented in hard copy, or preferably presented on a computer monitor,  
enabling direct capture of the entered data onto computer storage media.

Many of the data values entered by a user actually determine the type and  
30 range of further questions that must be asked of the individual, and thus it is

desirable that the computer system verify the accuracy of the data, in real time, during data entry, and then use a rule-based system to determine further forms for presentation to the user based on the prior data entry.

5 While this type of form-based data entry and capture is a very convenient and accurate method for the user, the initial set up costs for providing suitable, well-presented forms with underlying data capture logic that exactly match each organisation's specific data capture requirements is a complex task that requires advanced programming skills.

10

Each form must be specifically customised in terms of the presentation and content of questions or prompts to be displayed to the user, the format of data to be received, the validation rules for checking the data as it is being entered, and rule-based actions executed in real-time which determine

15 outcomes based on the data values received, such as determining further data capture requirements based on the received data.

The data capture logic must not only determine the information content and layout of the forms presented to the user, the data validation functions and  
20 the rules for use during form execution, but also must define how the data should then be exported to (eg. mapped into) the organisation's database, or exchanged with other databases. Clearly, the persons who are best placed to comprehend and define the organisation's data capture requirements (ie. the "business experts" who have detailed knowledge of the business  
25 requirements behind the data) are not likely to have the advanced programming skills necessary to implement the electronic data capture functions.

There are a wide variety of prior art computer applications which enable a person (acting as a form architect) to define an electronic data capture or exchange.

- 5 Many of these prior art systems provide WYSIWYG-type form building or data exchange capabilities intended for backoffice, client/server or traditional desktop environments, and may include facilities to define the function – ie. the data validation and rule based actions.
- 10 Some prior art applications allow a data model to be defined, enabling the data capture to be contained, transported and exchanged according to a predetermined standard.

15 Some prior art applications provide a means of central control where multiple users have assigned roles to manage the application usage.

20 Additionally, there are tools and utilities available, which can be used to define an electronic data capture or exchange, but these do not provide interfaces to abstract the form architecture from the underlying technology or expertise required in order to utilise the data capture or exchange.

Thus, there are a significant number of problems with the prior art approaches.

25 i) The WYSIWYG-based applications are prescriptive in their approach to form design. As shown in figure 7, an architect 8 defines data capture by use of a visual form 1 with positional (x-y) co-ordinates, upon which the architect graphically places the data items to be captured, ie. textboxes, radio buttons, drop down lists, menus etc.

The problem with this approach is that the architect is graphically designing a form 1, according to a specific target of execution 22 (ie. a single data capture requirement, rather than an approach of intent where the architect 8 merely specifies what data is to be captured or exchanged (ie. the intent)).

5

ii) In the prior art, the target execution of a data capture and/or exchange built using a WYSIWYG-based application is restricted to the specific technology or platform 22 in which the application operates. As illustrated in figures 5 and 6, if a data capture / exchange is required for execution 10 across multiple technologies / platforms, in the prior art, the architect is required to repeatedly define the form 1, function 2 and data model 3 container, using a different application for each single specific execution purpose 22 technology platform required. As shown in figure 5, each implementation of a form requires a separate build process for each different 15 technology/platform, even though there might only be one set of data capture requirements, rules/function and data model.

In this regard, XML tools and utilities can be used to create a single XML document to achieve this purpose, but this requires that the architect 20 possesses the necessary XML technical skills and understanding of the XML dialect and schema employed. The architect 8 is not provided with an environment with which they can specify their requirements of the data capture and/or exchange.

25 iii) Using WYSIWYG-based applications, a defined data capture executed as a form cannot also be used as part of an automated data exchange mechanism between systems. Some of these applications can be used to create data exchange mechanisms, or components thereof, but this is a separate function, and an existing defined data capture plays no part in the

construction or use of the data exchange, requiring the data definition 21, function 2 and data model 3 to be redefined.

In this regard, XML tools and utilities can be used to create a single XML 5 document to achieve this purpose, but this requires the architect to possess the necessary XML technical skills and understanding of the XML dialect and schema employed. The architect 8 is not provided with an environment with which they can specify the requirements of the data capture and/or exchange.

10

iv) None of the prior art described above provide the ability for the architect to construct a form according to an XML form definition standard, and validate that form against it, without requiring the appropriate XML technical skills and knowledge of the XML dialect employed.

15

v) None of the prior art described above provide the ability to automate form construction based on an XML form definition standard, or parts thereof. The architect has to manually construct the form. Some applications will automatically generate a form based on a database table 20 definition or similar, but this does not constitute a form definition standard, and the automation uses the entire table or model, rather than selected part(s).

vi) None of the prior art described above, provide the ability for the 25 architect to define the data model container for the form or to set conditions against which the form data is bound to the data model, without requiring appropriate XML technical skills and knowledge of the XML schema employed.

vii) None of the prior art described above supports the specific combination of creation, use, re-use and propagation of entire or part forms as templates, by multiple users with assigned roles and rights, utilising locking at form level to prevent conflicts.

5

It is an object of the present invention to provide a form design tool that automatically generates an appropriate form layout for presentation to a user during a data capture process, based on an architect's specification of data items, validation criteria and rule-based execution criteria.

10

It is a further object of the invention to provide a software application that enables an architect to define his or her data capture requirements, the criteria for validation of the data and the rule-based actions governing outcomes based on the data input, to create a data capture definition file that 15 can subsequently be used by a presentation / execution program to automatically generate a data capture form layout for presentation to a user, and execute data capture therefrom, in which the data capture definition file is platform independent.

20 Throughout the present specification, the expression "form" is intended to cover one or more of a series of computer-generated displays presented to a user, containing suitably presented data input areas such as text fields, check boxes, drop down menus, selection menus and the like. The expression "architect" is intended to refer to the person designing a form or, in the 25 context of the present invention, providing the data capture requirements that will result in automated building of the form. The expression "user" is intended to refer to the person entering data during a data capture session using the forms automatically generated on screen.

The present invention recognises that the process of defining the "intent" of the forms - ie. the process of specifying the data to be captured, by a business expert, can be divorced from the definition of the actual form layout. The present invention also recognises that the form layout can be 5 effected independently and automatically when the specification of the data to be captured has been provided in a suitable hierarchical manner.

The present invention provides a software application program which 10 enables an organisation to centrally define, manage and maintain their intent for electronic data capture requirements, which is effected by means of documents conforming to predetermined standards that can be deployed in multiple environments, where they are executed as forms.

According to one aspect, the present invention provides apparatus for 15 automatically building an electronic form for presentation to a user during a data capture process, comprising:

means for receiving as input a specification of data elements required during data capture, each data element having a type specification, and a logical relationship relative to other data elements in a hierarchical structure;

20 means for generating, from said input, a data capture definition file providing said specification of data elements and said hierarchical structure in a predetermined format; and

25 means for receiving said data capture definition file and automatically generating a plurality of visual displays for presentation to a user during execution of a data capture process, each input screen comprising a plurality of user input areas corresponding to the data elements and physically positioned on the screen in a manner corresponding to the defined logical hierarchical structure.

According to another aspect, the present invention provides apparatus for generating a data capture definition file for defining data elements required from a user during a data capture process, comprising:

- means for receiving as input a specification of data elements required
- 5 during data capture, each data element having a type specification, and a logical relationship relative to other data elements in a hierarchical structure, said type specifications and said hierarchical structure being usable for automatically determining a physical layout of visual displays for presentation to a user during a subsequent data capture process;
- 10 means for associating, with said data elements, a set of data validation requirements for validating data captured in respect of each of the data elements;
- means for associating, with said data elements, a set of rules for execution during a subsequent data capture process, for further enabling
- 15 automatic determination of a physical layout of the visual displays to be presented to a user during said subsequent data capture process based on values of data captured during said data capture process;
- means for generating said data capture definition file providing said specification of data elements, said hierarchical structure, said data validation requirements and said set of rules in a predetermined format for
- 20 subsequent execution by a data capture process.

According to another aspect, the present invention provides an apparatus for generating a generating an electronic form for presentation to a user during a data capture process, the apparatus comprising:

- means for receiving as input a data capture definition file in a predetermined format providing a specification of data elements required during data capture, each data element having a type specification and a logical relationship relative to other data elements in a hierarchical structure;

means for automatically generating a plurality of visual displays for presentation to the user, each visual display including a plurality of user input areas and user prompts relating thereto corresponding to the data elements, each being physically positioned on the displays in a manner 5 corresponding to the defined logical hierarchical structure.

According to still further aspect, the present invention provides a method for building an electronic form, a method of generating a data capture definition file, and a method of generating an electronic form for presentation to a user 10 as carried out by the apparatus defined above.

Embodiments of the present invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 shows a schematic diagram at system level illustrating the 15 environment of a form builder according to the present invention;

Figure 2 shows a more detailed schematic diagram of the form builder and execution modules according to the present invention;

Figure 3 shows a schematic diagram of the data capture definition file building operation;

20 Figure 4 shows a schematic diagram of the data capture definition file building operation including automatic section and element generation;

Figure 5 is a schematic diagram of a prior art platform dependent form building operation;

25 Figure 6 is a schematic diagram illustrating prior art data capture and data exchange operations;

Figure 7 is a schematic diagram of a prior art graphical form design process;

Figure 8 is a screenshot of a first stage input box in a new form definition process;

Figure 9 is a screenshot of a form definition box for specifying sections, sub-sections and elements that will make up a form;

Figure 10 is a screenshot of a form definition box indicating the hierarchical structure of sections, sub-sections and elements that make up a  
5 form;

Figure 11 is a screenshot of an input box for defining a new section in the form structure hierarchy of figure 10;

Figure 12 is a screenshot of an input box for defining a new data element in the form structure hierarchy of figure 10;

10 Figure 13 is a screenshot of an advanced input box for defining a new element in a form structure hierarchy of figure 10;

Figure 14 is a screenshot of an input box for defining a new rule in a form structure definition process;

15 Figure 15 is a screenshot of an input box for defining actions under a rule in the form structure definition process;

Figure 16 is a screenshot of an input box for defining event triggers for rules in the form structure definition process;

20 Figure 17 is a screenshot of a form structure definition box indicating a binding or mapping of each of the hierarchical form sections, sub-sections and elements with a corresponding data exchange destination entity;

Figure 18 is a screenshot of an input box for adding a new binding entity used in the data exchange definition;

Figure 19 is a screenshot of an input box for defining binding conditions in the data exchange definition;

25 Figure 20 is a screenshot of an input box for defining attributes of binding entities in the data exchange definition;

Figure 21 is a screenshot of an input box for binding an evaluation expression to an element in the hierarchical form definition and data exchange definition;

Figure 22 is a screenshot of a template definition box for specifying sections, sub-sections and elements that will make up a template form;

Figure 23 is a screenshot of a template definition box indicating the hierarchical structure of sections, sub-sections and elements that make up a template form;

Figure 24 is a screenshot of a propagation instruction box defining actions to be taken on change in a template;

Figure 25 is a screenshot of a template change update box used to alert an architect of changes to a template;

Figure 26 is a screenshot of an impact analysis box to indicate the impact on existing forms resulting from changes to a template;

Figure 27 is a screenshot of a preview box illustrating the sections, subsections and elements in a selected form definition;

Figure 28 is a screenshot of an export validation control box;

Figure 29 is a screenshot of an export destination definition box for use in the data exchange definition;

Figure 30 is a screenshot of an import destination definition box for use in the data exchange definition;

Figure 31 is a screenshot of a form definition release control box;

Figure 32 is a screenshot of a form destination release definition box;

Figure 33 is a screenshot of a document permission properties input box for entering ownership and use properties of form definition files;

Figure 34 is a screenshot of a trigger list display box showing all triggers defined in a form definition;

Figure 35 is a screenshot of a rule list display box showing all rules defined in a form definition;

Figure 36 is a screenshot of a rule repair input box for correcting invalid rule assignments;

Figure 37 is a screenshot of an initial user input screen for data capture, showing form sections to be filled in by the user;

Figure 38 is a screenshot of a user input screen for providing as first input a number of applicants;

Figure 39 is a screenshot of a user input screen resulting from completion of data entry in the screen of figure 38;

5 Figure 40 is a screenshot of the user input screen of figure 39, but presented as an on-line web page;

Figure 41 is a screenshot of a user input screen for providing as input data corresponding to a general questions section of the form;

10 Figure 42 is a screenshot of a user input screen resulting from input “yes” to one of the general questions of figure 41;

Figure 43 is a screenshot corresponding to figure 41, but presented as an on-line web page;

Figure 44 is a screenshot corresponding to figure 42, but presented as an on-line web page;

15 Figure 45 is a screenshot of an alert box generated during data validation;

Figure 46 is a screenshot of a completion control box presented after data entry;

20 Figure 47 is a screenshot of an alert box corresponding to that of figure 45, but presented as an on-line web page; and

Figure 48 is a screenshot of a completion control box corresponding to that of figure 46, but presented as an on-line web page.

With reference to figures 1 and 2, the invention provides a software application 30 which enables an organisation to centrally define, manage and maintain their electronic data capture requirements in predetermined data capture definition file formats, which are preferably effected as self-contained XML documents 17, although other standard existing or future document formats could also be used.

Each data capture definition file 17 consists of a form definition 1, a function definition 2 and a data model definition 3, that can be deployed in multiple environments, where they are executed as forms and/or as part of a data exchange. In particular, the data capture definition file 17 comprises a 5 specification of data elements that are required for data capture, each data element having a type specification that specifies the type of data to be collected, and an indication of its logical hierarchical position relative to other data elements in a hierarchical structure.

10 The application 30 can be fully operated by ordinary persons 31, acting as form architects having no particular technical knowledge or understanding of programming, including XML and scripting technologies involved. The application 30 can be installed and maintained with minimal or no technical support.

15 Furthermore, the application 30 enables the data capture to be defined in a standard manner, using a form definition standard 4. The function 2 is defined as data validation and rules assigned to events, and the data itself to be contained within a data model 3 for storage, transport and exchange 20 between systems 18, 19, 20 that offer interfaces adhering to the same model.

The application 30 supports multiple architects 31 with assigned roles and rights, and utilises locking 32 at document level to prevent conflicts. To enable joint construction and re-use, templates can be created, used and 25 propagated within other documents – as part or whole.

The application 30 preferably uses a database repository 34 to store the documents 17, 33 that collectively form an organisation's data capture requirements.

By means of user accounts 35, passwords, groups, roles and rights (assigned to individual documents 33), the application 30 preferably enforces security to support multiple architects and provide control over rights.

5 Preferably, an administrator account 40 exists to administer the security, with the ability to create, delete or edit user accounts 35, groups or roles, reset passwords, change document ownership or unlock a locked document.

10 To prevent document change conflicts, the application 30 preferably employs document level locking. In order to edit a document, the architect 8, 31 must 'lock' the document 17, 33 for editing. Whilst 'locked', only that architect is able to make and save changes. Other architects can read the document whilst it is locked for editing.

15 Preferably, the document creator 8, 31 is the document owner. Only the document owner can delete the document and change the rights that other users have over the document.

20 In order to keep track of document history and releases, preferably the application 30 supports versioning and revision. When a document 17, 33 is versioned or revised, a read-only copy is made at that point and the original document major or minor version number is increased respectively.

25 Additionally, the application 30 preferably provides the following facilities at document level, to aid management of an organisations data capture requirements:

1. Create a new document
2. Create by copy – a document can be copied as a new document
- 30 3. Rename a document

4. Import/export or release a document
5. Preview a document – test deployment of a document in a data capture operation
- 5 The process of defining a data capture / exchange consists of building the three main components contained within the data capture definition file 17, preferably an XML document, for deployment by an end user 18 via a presentation / execution layer 7.
- 10 The data capture definition file comprises a form definition 1 which complies with a form definition standard 4. The architect 8 specifies his or her intent 6 for the contents and hierarchical structure of the form. The contents and structure comprise a definition of the data items to be collected in execution of the form, each data item having a data type, and a relative position in a hierarchical structure comprising sections and sub-sections.
- 15 The form definition does not define the layout of the data as it will be presented on a user input screen for data capture, since this aspect will be interpreted and executed 10 at the presentation layer 7. A significant feature of this presentation / execution layer 7 is that, because it operates upon a data capture definition file 17, 33 that conforms to a predetermined standard, it can be operated on multiple technologies / platforms 9.
- 20

The function definition 2 in the data capture definition file 17, 33 includes the data validation, rules and events that define the function of the form during its execution either at the presentation / execution layer 7, or as part of a data exchange 19, 20.

The data model container definition 3 indicates how the data captured is to be formatted in the output resulting from data capture. This adheres to a

data model standard 5 used for storage, transport or exchange between systems that offer interfaces adhering to the same model.

With reference to figure 3, the application 30 enables definition 15 of the 5 form structure and content 14 of the data capture / exchange requirements according to the form definition standard 4. The definition includes a plurality 13 of data elements in sections and sub-sections defining a hierarchy to the data elements. It is this hierarchy that will be used, in part, by the presentation / execution layer 7 to determine the final layout of the 10 forms presented to the data capture end user 18.

The architect 8 is abstracted 12 from requiring any knowledge or understanding of the form definition standard 4 by means of an interface that enforces conformity through a validation process 11, and only presents the 15 sections and elements contained therein for selection. When adding new sections or elements 13, the architect 8 can specify the type of section, ie. a column section, and the data element type. A non-exhaustive list of examples of data types is: *text, number, currency, date, list, combo-box, caption, option, checkbox, yes/no, radio button, popup, or picture.*

20

Additionally, data elements can have characteristics that can be defined. A non-exhaustive list of possible data element characteristics is: *precision, default value, prefix/suffix, width, height, currency, read only or leading zeros.*

25

All of these types and characteristics are preferably defined by the form definition standard 4.

With reference to figure 4, the application 30 preferably enables automated generation 16 of the data capture definition file 17, 33, or a part thereof, based on the form definition standard 4.

5 In this manner, the architect 8 is able to specify 15 the intent 6 for the data capture requirements according to the form definition standard 4. The architect 8 does not specify how the form is presented, since this is interpreted from the data capture definition file 17 during execution 10 at the presentation layer 7, which can be across multiple technologies / platforms

10 9.

During execution 10 of the form, the data validation, rules and events define the function of the form – the operation.

15 The application 30 preferably enables definition of rules and their respective rule functions 2 by providing a rule builder interface that enables an architect 8 to create complex rule actions and conditions, and assign them to the events (eg. when the value of a data element is provided), without requiring any knowledge of the underlying script that is generated.

20 Basic data validation functions can be assigned to the individual elements in the same way the element type and characteristics are defined, including such items as *mandatory*, *max length*, *minimum* or *maximum value* (as determined by the form definition standard 4).

25 The application 30 preferably enables the storage, transport or exchange of the data capture, by enabling the architect to bind the form elements to a defined XML data model. During the executable lifecycle of the form, the data captured is stored within the data model 3, where rule actions can be

30 effected upon it, and data transport or exchange can take place to/from

external data sources 19, 20 also adhering to the same data model. Specification of the data model construct, is stored within the XML document as bindings.

5 The application abstracts this construction, by providing an interface, which  
enables form elements being bound to the entities and attributes within the  
data model, but does not require the architect to have any knowledge or  
understanding of the underlying XML and schema employed. Additionally,  
by means of a condition builder interface, the application enables the  
10 architect to specify logical conditions that must evaluate true during form  
execution, in order for the specified elements of the form to be bound to the  
data model.

For data import, Xpath or XSL queries are required that specify the data  
15 retrieval mechanism from the data source. To aid the architect in the  
construct and testing of these queries, the application 30 preferably provides  
a Query Builder tool.

The application 30 preferably enables joint construction and re-use of a data  
20 capture (or part thereof) by multiple architects, by the use of templates.

An existing document 17, 33 of part thereof, can be selected to form a new  
template, or if desired, a template can be created and built from an empty,  
new template. A template is preferably owned and modified by the template  
25 creator. A template can preferably be used in the construction of a  
document, to form part of that document, or the whole. A template can  
preferably be used in the construction of another template, and there can be  
several layers of nested templates. When a template is used in another  
document or template, it is known as a template copy, which is linked to the  
30 original.

When a template is modified, all documents or other templates that use the modified template will preferably be automatically flagged for change. The next time these documents or other templates are accessed, the architect 8 is 5 notified of the changes made to the originating template, to which they can accept or reject those changes to be propagated to the template copy within the receiving document or template currently being accessed.

A template copy in another document or template can be selected to 'break 10 link' with the original template. When selected to 'break link' the template copy is no longer identified as such and any changes made to the original template are no longer flagged for propagation in that document or template.

To aid control and management of templates, an impact analysis facility may 15 be provided on templates, which facility reports the names of all the documents and other templates that have copies of that template.

The application enables the data capture requirements as self-contained 20 XML documents, to be transferred between separate installations of the application, using an import and export facility.

During import the document is validated against the form definition standard 4 and data model standard 5, and any identified errors are listed for the architect to correct, using the application 30.

25

Upon selecting to export a document, it is first validated against the form definition standard 4 and data model standard 5, to ensure it conforms. If it passes validation, the data capture requirements for the specified document containing the form, function and data model are extracted from the central 30 database repository 34 as a self-contained and portable XML document 17,

33, which can be imported at another installation of the application, or the same installation as a duplicate.

When a data capture definition is completed and ready for deployment, it  
5 can be released as a self-containing XML data capture definition file  
(document), consisting of the form, function and data model. The release  
process first validates the document against the form definition and data  
model standards, to ensure it conforms. If it passes validation, the form,  
function and data model for the data capture, are extracted from the central  
10 repository as a portable self-contained XML document.

As shown in figure 2, the self-contained XML document 17 can be deployed  
for execution 10 at the presentation layer 7 for an end-user 18 and / or as  
part of a data exchange 19, 20 across multiple technologies / platforms /  
15 environments 9.

A self contained XML document 17 released from the application can be  
executed at the presentation layer 7 for display to a data capture user, for  
data capture 18, using any suitable host runtime element. There are a  
20 number of these available, operating in different technologies /  
environments, such as standalone desktop computer, and client/server  
solutions in different technologies (eg. server side Java, client side browser,  
or server side Microsoft, client-side browser). The client-side browser  
capability of the runtime element does not require any components to be  
25 downloaded for data capture – it is purely html and script sent directly from  
the server. This enables deployment of the presentation / execution layer 7  
across multiple devices and platforms, such as internet kiosk, hand-held  
device, etc. Thus, the defined data capture requirements encapsulated as a  
self-contained XML document 17 can be executed 10 across multiple  
30 technologies / platforms 9.

The runtime presentation / execution layer 7 interprets the data capture definition file 17 for presentation to the end-user 18, at which time the actual display characteristics such as form layout and position of all data elements 5 are determined according to the hierarchical structure defined in the data capture definition file. The presentation / execution layer also executes the function defined in the data capture definition file, which defines the operation and interaction with the end-user 18.

10 As data is captured from the form 1 and function 2, it is stored in the data model 3, which can be exchanged 19, 20 with other systems, which offer interfaces that adhere to the same data model definition.

15 In the same manner that the runtime presentation / execution layer executes 10 a self-contained XML document 17, it can also execute 10 as part of a data exchange 19, 20. This can occur in place of, or in addition to the presentation layer 17.

20 The runtime host described above provides interfaces that enable the data capture stored in the data model 3 to be transferred to an external file system or message queue. In similar fashion, the data model 3 can be pre-populated from an external file system or message queue.

25 In this manner, the XML document can be executed as part of a data exchange whereby data can be imported from an external data source and/or the data capture, and exported to another external data source.

30 An exemplary sequence of generation of a data capture definition file suitable for generation of a form during execution of the data capture process will now be illustrated.

As shown in figure 8, when a new data capture definition file (referred to in the illustrations as a PAC – “Product Application Component), is created by an architect 8, they first specify the name 81, title 82 and XML standards 83 employed – eg. the ISML DTD standard and the message (output) standard. Optionally, they can also specify control dates 84 – effective & expiry, product type/sub-type, product provider, associated documents (for printing) and whether it is for test purposes, in an input box 80.

5

10 With reference to figure 9, in a second input box 90, in the main window 91 on the right, the architect 8 can define the sections, sub-sections and data elements in the sections and sub-sections that will make up the data capture form, by use of context sensitive menus 92.

15 With reference to figure 10, the content and structure of the form for presentation to a user during a data capture process is represented to the architect in display box 100 as a hierarchy tree 101, which is constantly updated as sections 102, sub-sections 104 and elements 103 are created. The hierarchy tree 101 is a logical representation of the relationship between data elements 103 and their respective sections 102 and sub-sections 104 which will be used to determine the layout of visual displays presented to a user during a data capture process.

20

The hierarchy tree 101 can be used to navigate the sections 102, sub-sections 104 and data elements 103, any of which items (referred to as “node”) can be selected by the architect to view or set properties of that node, and perform functions. Examples of such functions include: add new section or element, copy item, paste item, delete item, make template, create or assign rules to triggers / events that occur as the data capture process is executed.

With reference to figure 11, to create new sections and sub-sections, the architect selects the type of section – either a main section, sub-section or variant – to bring up a new section input box 110, in which may be specified a section name 111 and a section title 112.

5

Main sections can be added to the form root, sub-sections and variants to main sections.

10 The input box 110 may also be used by the architect to specify attributes of the section, such as style type 113 which will affect the style of presentation of the section to the user during the data capture process.

15 With reference to figure 12, the input box 120 for adding an element is described. The architect 8 selects the respective section or sub-section that they wish to add an element to, and using the context sensitive menu, select to add a new element.

20 Each element is given a title 121, and a question or prompt 122 that will be displayed to the user during the data capture process. Elements can be of various types, including text, number, yes/no, lookup (list), etc., and mandatory and default values can also be specified.

25 With reference to figure 13, an advanced input box 130 for element entry is shown. Input box 130 is called by using the advanced tab 124 in the input box 120 (figure 12). In advanced input box 130, the architect can also specify advanced attributes 131 of the prompts displayed to the user during the data capture process, such as: width, prefix, suffix, height, minimum and maximum values, read only, etc.

Again using the context sensitive menu 92 from a selected item in the hierarchical tree 101 (eg. section 102 or element 103), the architect 8 can call up a rule creation box 140 to create rules and assign them to the triggers or events that occur when the data capture process is executed, such as form 5 load, element change, section enter / leave, etc. This defines the form function 2.

Rules take the form IF the condition is true, THEN perform these actions, ELSE perform these different actions, as defined in the IF THEN ELSE 10 boxes 141, 142, 143. Rule conditions 141 can have multiple actions 142. Further options are available, such as disable rule 145, validate rule 146 – to check the rule logic is valid, and view triggers 147 – to see which events (triggers) the rule is assigned to.

15 As shown in figure 15, a rule action edit box 150 enables the setting of rule actions 151 which include: set a value to an element, perform a function (such as validate a postcode or make an external call for information or validation), enable/disable, hide/show, display a message or warning, execute another rule, etc.

20

Rules are assigned to triggers (events) by first selecting the event associated with the section, element or form, such as Formload, section enter/leave, element change, etc; and then specifying the rule to be triggered when the event occurs in real-time as the form is executed during the data capture 25 process. Figure 16 shows a viewing and editing box 160 for triggers and their properties. An event (trigger) can have multiple rules assigned listed in window 161 (with priorities set to define the order of execution), and a single rule can be assigned to multiple events (triggers) as required.

Forms can be bound to a standard data model, so that the captured data (referred to as the message) can be easily exchanged between systems using the same data model. Within the application 30, the main control box 100, also now shown in figure 17 as control box 170, can also display (by using 5 the bindings tab 171, the bindings for each data item with an external data model. The architect defines the bindings using context sensitive menus.

The data element bindings 172 are also displayed in a hierarchical tree 173, consisting of the message entities, eg. personal client 174, and the message 10 attributes, eg. home address. The hierarchical tree 173 can be used to navigate the data element bindings, where any item (referred to as node) can be selected to view or set properties, and perform functions, such as add new entity or attribute, copy, paste, delete, etc.

15 The process of creating the bindings 172 consists of defining the message entities, eg. personal client, and then mapping the data elements 103 as presented on the form displayed during data capture to the attributes of the message entities, eg. mapping home address from the personal details section in the form to the home address attribute of the personal client entity.

20 The selected message standard will contain a number of entities, which represent the topic or subject of data, eg: personal client. The architect can select, using box 180 in figure 18, to add an entity 181 from the list of available entities 182 within the message standard and define properties.

25 If the message is hierarchical, then the application 30 will preferably only allow the architect to select the entities applicable to the position in the hierarchy.

30 The architect can specify a condition 183 upon which the entity 181 is bound to the form, eg: IF Age is less than 70 THEN bind the entity to the

form. Complex binding conditions can be created using logical AND and OR conditions, using the add new condition box 190 in figure 19, eg. IF the Age is less than 70 OR the Age is greater than 25.

- 5 Each entity in the message standard employed, has a set of defined attributes, eg. in the example of the personal client entity, one attribute is the home address, another is surname, etc.

As shown in figure 20, the architect can select an entity 172, 201 (from the 10 bindings tree 173) and, using the bind attribute instance box 200, add relevant attributes 202, and define the form element(s) to bind.

With reference to figure 21, optionally, attributes 202 can be bound to an expression 211 instead of directly to a form element, eg. the age attribute 15 could be bound to an expression - calcage(date of birth), using expression definition box 210.

In a preferred embodiment, templates form an important role in the creation and maintenance of data capture definition files, because they can greatly 20 reduce the effort to build and maintain them, whilst enabling multiple architects to work on the same data capture definition file.

A template is a master copy of a part (or can be entire) data capture definition file, such as personal details. The template can be copied into 25 existing data capture definition files, to form part of that file, or into another template to form part of that template, and so on.

When a template is copied into another data capture definition file or template, it is linked to the original so that when changes are made to the

original template, they can be propagated to the copies that exist for other data capture definition files.

Templates can be created in any combination of the following ways.

5

1. In exactly the same method as creating a normal data capture definition file, described above in connection with figure 10, except that the template is created using the template tab 221 in window 220 (figure 220) to select a list 222 of templates. The hierarchical tree 223 of the selected 10 template is displayed in the right hand window.
2. By making a template from an existing section or element by selection of part of a tree 101.
- 15 A template may be copied into a form or other template, by simply dragging the template from the left hand window to the form/template in the main window. The template becomes part of the form/template, but is distinguishable by a different colour as shown in figure 23.
- 20 When changes are made to the original template, the changes are marked for propagation so that other data capture definition files or templates that use the template are notified of the changes and can receive those changes. These are shown to the architect in a propagation box 240.
- 25 When a data capture definition file is accessed that uses a changed template, the architect is notified of the changes and can accept or reject them using a change control box 250 in figure 25.

When making changes to templates, in the preferred embodiment an impact analysis box 260 is available to determine the impact the changes will make by listing the affected forms and templates.

5 A template contained within a data capture definition file or other template can have its links broken from the original template so that changes are not propagated. When a template within a data capture definition file or other template 'breaks links' with the original, it is no longer a template and appears in the same colour as the rest of the form content.

10

In the creation or maintenance of an existing form, there are a number of features and functions available to the architect.

15 As shown in figure 27, in the left hand window 271, a current list of existing defined data capture definition files 272 are listed, which can be selected to perform form level functions. Ability to perform these functions preferably depends on whether the selected data capture definition file is locked for editing (possibly by another user), the user's rights, and the rights set on the form by the form owner / creator.

20

Any existing data capture definition file can be copied in its entirety as a new file, which can be easily edited as required, using a copy function.

25 The selected form can be versioned (eg. a major version number increased) or revised (minor version number increased). In both cases, the data capture definition file is copied, and the new copy has a newer version or revision number.

30 The selected data capture definition file can be locked for editing if unlocked, or unlocked if locked, so that others may edit it.

The selected data capture definition form may be displayed in tree view 101 in the right window (as shown in figure 10), where the contents and properties of the form can be viewed, and (if locked for edit) edited.

5

Alternatively, the selected section 273 or sub-section of the data capture definition file may be shown 274 as it would be shown to the data capture user during the data capture process, ie. as it would be executed by the presentation layer 7 in real-time for the data capture user. This enables the 10 architect to test functionality and view exactly how the resulting form sections would appear to the end-user.

With reference to figure 28, the selected data capture definition file is preferably first validated (using control box 280) against the form standard 15 4. The validated document may then be exported using export control box 290, to destination address as specified at window 291, as a portable self-contained XML document 17 in proprietary format. The data capture definition file 17 can be imported into the same or other installation of the application 30 as required.

20

During import, as shown in figure 30, using import control box 300, the selected data capture definition document is first validated against the form standard 4 employed and then imported into the application's repository 34 at the address indicated by window 301, where users can access it in the 25 normal way.

The selected data capture definition file is first validated against the form standard 4 employed using validation control box 310 (figure 31) and then released (release control box 320 in figure 32) as portable self-contained 30 XML document 321 in the standard format employed where it can be

deployed for execution at the presentation layer 7 – eg. on a stand-alone desktop, on an online server/client browser environment, etc.

5 Permissions for a selected data capture definition file can be viewed and / or changed accordingly using a document permission properties control box 330 shown in figure 33.

10 Selected elements, sections or rules can be copied and pasted within or between data capture definition files using a copy / paste function. The properties of a selected section, element or rule can be viewed and / or changed as required (providing the form is locked for edit).

15 A trigger dialog window 340 (figure 34) may be displayed showing all events (triggers) which have rules assigned. The rule dialog window is displayed showing all rules, and provides a search function shown as search control window 350 (figure 35).

20 A move up/down function may be provided to move a selected element, section or rule up or down within the same level in the data element tree hierarchy.

25 When rules are copied between different forms or elements/sections are deleted upon which rules were assigned to their events (triggers), the rule can be considered as broken – that is it does not have a valid assignment. To assist, a repair rule feature is available as shown in the rule repair control box 360 in figure 36. This control box facilitates the identification and correction of invalid assignments.

30 Sections, elements and rules can be dragged and dropped within the same data capture definition file or between data capture definition files. When

dragging/dropping between the same file, the item is moved, whereas when the item is dragged/dropped between forms the item is copied.

5 In a make template function, the selected section or element becomes a template.

As discussed previously, once a data capture definition file 17 has been generated, this file may be executed by the presentation / execution layer 7, which is platform independent, during a data capture process. The 10 presentation / execution layer performs the function of displaying a plurality of visual displays, to a data capture user 18, that prompt the user to enter data corresponding to each relevant data element in the data capture definition file.

15 The layout of each visual display is determined, by the presentation / execution layer, according to the logical relationship between the sections, sub-sections and data elements which are defined by the hierarchical structure in the tree 101. The data capture definition file 17 does not contain any instructions relating to absolute physical positioning of questions and 20 prompts on the visual displays presented to the user during runtime of the data capture process. Only relative physical positioning of user prompts for data element capture, and the sequential progression of user prompts for data element capture are inferred from the data element hierarchical tree by the presentation / execution layer.

25

As illustrated in figures 37 and 38, respectively corresponding to a stand-alone PC version of the presentation / execution layer 7, and a web-based version, a first visual display 370 presents option box prompts to the user for data input corresponding to a first section "number of applicants" of the data 30 element tree. The prompts may be displayed either as click boxes 372 or as

drop-down selection box 373, depending upon the application running the presentation / execution layer. Figures 39 and 40 illustrate corresponding user input screen for data entry during the data capture process. In each case, the format and positioning of each of the data input prompts 391 to 395 5 is determined during runtime of the data capture process according to the data element hierarchy and data type.

For example, in the first applicant details user prompt display screen 390, the data elements have equal status or level within the hierarchical tree 10 within one sub-section, and are therefore displayed accordingly by the presentation / execution layer 7 as a single column.

Similarly, the data capture process 7 detects that the data type for "title" 391 has a plurality of allowed values (Mr, Mrs, Ms, Dr etc) and therefore 15 interprets the user input prompt as a drop down menu. Similarly, the process detects that the data type for "Forenames" admits of freeform text input of maximum length  $n$  characters, and provides an appropriate text input box 392. The "date of birth" element is detected as data type "date" and is therefore presented as a date format input box 393.

20

It will be understood that the data capture process running on the presentation / execution layer interprets the hierarchical data element tree to determine that sections and certain sub-sections of data element prompts should be presented on independent "pages" or screens, each element being 25 afforded a presentation status dependent upon its ranking in the tree. Thus, user prompts for elements having a common sub-section are preferably presented in either column, row or matrix format with each element prompt having equal "status" in the presented display. The order of the element prompts may be determined according to the sequence of the elements in the 30 tree. Prompts corresponding to separate sub-sections on a common display

page may be incorporated within separate frames or separated by appropriate boundary structures.

Different sub-sections may be presented on separate display pages, or on the  
5 same displays depending upon the number of data element prompts required, and the sizes of those prompts. The data capture process makes a determination, during runtime, of the best fit for each set of user prompts according to the size, content and complexity of the prompts required by the data capture definition file.

10

Because the layout of the form presented to the user is determined during runtime of the data capture process, the data capture process can make allowance for the restrictions imposed by the user display in terms of screen size, display resolution, colour, availability of graphics etc. Similarly, the  
15 data capture process can accommodate use of any suitable available icons or graphics available for certain types of data entry. For example, for date entry at prompt 393, only a procedure for numeric keyboard entry might be available in figure 39, whereas in the web-based version of figure 40, a separate procedure call for a date entry subroutine 397 might be available.

20

In figure 41, a user display 410 of prompts 411 for input of data corresponding to a series of "yes/no" data elements 412 of equal status within a "general questions" section 413 is shown.

25 With reference to figure 42, the effects of rule-based actions defined in the data capture definition file is shown in display 420. In this display, the user has selected the "yes" option 422 in response to prompt 421. As a consequence, this event fires a rule-based action to display a new user input button 423 to enable the collection of free text notes regarding the previous

response in a new user data entry window 424. Figures 43 and 44 illustrate corresponding events in a web-based data capture process.

Upon completion of, or during, the data capture process, the data is verified  
5 by the presentation / execution layer 7 according to the data verification specification contained in the data capture definition file 17. Where conflicts with the data validation specification are found, an alert window 450 is displayed to the user. This may take the form of a to-do list of items for correction, together with a diagnosis 451 of the error.

10

Upon completion of the validation process by the presentation / execution layer 7, a control box 461 in window 460 may offer the data capture user the opportunity to accept and lock the completed form. Figures 47 and 48 illustrate corresponding displays to figures 45 and 46 in a web-browser  
15 based implementation.

Other embodiments are within the scope of the appended claims.

## CLAIMS

1. Apparatus for automatically building an electronic form for presentation to a user during a data capture process, comprising:

5 means for receiving as input a specification of data elements required during data capture, each data element having a type specification, and a logical relationship relative to other data elements in a hierarchical structure;

means for generating, from said input, a data capture definition file providing said specification of data elements and said hierarchical structure  
10 in a predetermined format; and

means for receiving said data capture definition file and automatically generating a plurality of visual displays for presentation to a user during execution of a data capture process, each visual display comprising a plurality of user input areas corresponding to the data elements and  
15 physically positioned on the display in a manner corresponding to the defined logical hierarchical structure.

2. The apparatus of claim 1 wherein the means for generating generates said data capture definition file in XML format.

20

3. The apparatus of claim 1 or claim 2 in which the data capture definition file further includes a functional specification of data validation operations to be performed in respect of at least some of said data elements during execution of said data capture process, said means for receiving further including means for executing said data validation operations during  
25 said data capture process.

4. The apparatus of any one of claims 1 to 3 in which the data capture definition file further includes a functional specification of rule-based actions to be taken during execution of the data capture process, said means  
30

for receiving further including means for executing said rule-based actions during said data capture process, and determining successive visual displays for presentation to the user during the data capture process according to values of data captured and the rule-based actions applicable thereto.

5

5. The apparatus of claim 1 in which the means for generating the data capture definition file further includes means for incorporating a functional specification of a data model defining the bindings of data elements with an output message format.

10

6. The apparatus of claim 1 in which the means for generating the data capture definition file further includes means for incorporating a functional specification of data exchange requirements according to a form definition standard.

15

7. The apparatus of claim 1 in which the means for generating the data capture definition file further includes means for enabling automatic building of portions of said data capture definition file according to a form definition standard.

20

8. The apparatus of claim 4 in which the means for generating the data capture definition file further includes means for incorporating said rule-based actions to be performed during execution of the data capture process, by a rule builder interface that enables rule actions and conditions to be 25 assigned to data capture events.

9. The apparatus of claim 1 in which the means for generating further includes binding interface means for incorporating binding definitions into said data capture definition file, each binding definition defining the binding 30 of a data element to a defined external data model.

10. The apparatus of claim 1 further including means for ensuring that said specification of data elements complies with a form definition standard.

5 11. The apparatus of claim 1 further including means for executing a data capture process, comprising:

means for receiving a data capture definition file;

means for generating a succession of visual displays for presentation to a user, the physical layout of said visual displays being determined during

10 execution of the data capture process, according to the defined data elements and their hierarchical structure in the data capture definition file, and according to process and display conditions prevailing in the platform executing the data capture process.

15 12. The apparatus of claim 11 in which the means for executing the data capture process further includes means for executing data validation operations according to a functional specification of data validation operations defined in said data capture definition file.

20 13. The apparatus of claim 11 in which the means for executing the data capture process further includes means for executing rule-based actions according to a functional specification of rule-based actions defined in said data capture definition file.

25 14. Apparatus for generating a data capture definition file for defining data elements required from a user during a data capture process, comprising:

means for receiving as input a specification of data elements required during data capture, each data element having a type specification, and a

30 logical relationship relative to other data elements in a hierarchical structure,

said type specifications and said hierarchical structure being usable for automatically determining a physical layout of visual displays for presentation to a user during a subsequent data capture process;

5 means for associating, with said data elements, a set of data validation requirements for validating data captured in respect of each of the data elements;

means for associating, with said data elements, a set of rules for execution during a subsequent data capture process, for further enabling automatic determination of a physical layout of the visual displays to be 10 presented to a user during said subsequent data capture process based on values of data captured during said data capture process;

means for generating said data capture definition file providing said specification of data elements, said hierarchical structure, said data validation requirements and said set of rules in a predetermined format for 15 subsequent execution by a data capture process.

15. The apparatus of claim 14 wherein the data capture definition file conforms to a standard that can be executed on a plurality of different platforms.

20

16. The apparatus of claim 15 in which the data capture definition file is generated in XML format.

17. The apparatus of claim 14 further including means for incorporating, 25 into said data capture definition file, a functional specification of data exchange requirements according to a form definition standard.

18. The apparatus of claim 14 further including means for enabling automatic building of portions of said data capture definition file according 30 to a form definition standard.

19. The apparatus of claim 14 further including binding interface means  
for incorporating binding definitions into said data capture definition file,  
each binding definition defining the binding of a data element to a defined  
5 external data model.

20. The apparatus of claim 14 further including means for ensuring that  
said specification of data elements complies with a form definition standard.

10 21 The apparatus of claim 14 further including means for assigning, to  
each data capture definition file, document ownership and execution rights.

15 22. The apparatus of claim 14 further including means for generating at  
least a part of the data capture definition file by automatic copying of a  
global template.

23. The apparatus of claim 22 further including means for correlating  
changes made in global templates with relevant parts of data capture  
definition files that have been built using those templates.

20 24. The apparatus of claim 23 further including means for generating an  
impact analysis report identifying potential consequences to relevant data  
capture definition files resulting from a proposed change to a template.

25 25. The apparatus of claim 14 further including a document validation  
module for ensuring compliance of a generated data capture definition file  
with at least one of a form definition standard, a function definition standard  
and a data model standard.

26. The apparatus of claim 14 in which the means for generating said data capture definition file further includes means for associating each data element with a respective section or sub-section in said logical hierarchical structure.

5

27. The apparatus of claim 11 in which the means for generating a succession of visual displays further comprises:

means for inferring a relative physical positioning of user prompts for data element capture and a sequential progression of user prompts for data element capture from the data capture definition file, and

means for determining absolute physical positioning of user prompts and presentation styles thereof according to criteria defined in the means for executing the data capture process, and not the data capture definition file.

15 28. The apparatus of claim 28 in which the means for generating said data capture definition file and the means for generating a succession of visual displays operate on different computing platforms.

29. Apparatus for generating an electronic form for presentation to a user during a data capture process, the apparatus comprising:

means for receiving as input a data capture definition file in a predetermined format providing a specification of data elements required during data capture, each data element having a type specification and a logical relationship relative to other data elements in a hierarchical structure;

means for automatically generating a plurality of visual displays for presentation to the user, each visual display including a plurality of user input areas and user prompts relating thereto corresponding to the data elements, each being physically positioned on the displays in a manner corresponding to the defined logical hierarchical structure.

30. A method of automatically building an electronic form for presentation to a user during a data capture process, comprising the steps of:

5 receiving as input a specification of data elements required during data capture, each data element having a type specification, and a logical relationship relative to other data elements in a hierarchical structure;

10 generating, from said input, a data capture definition file providing said specification of data elements and said hierarchical structure in a predetermined format; and

15 receiving said data capture definition file and automatically generating a plurality of visual displays for presentation to a user during execution of a data capture process, each visual display comprising a plurality of user input areas corresponding to the data elements and physically positioned on the display in a manner corresponding to the defined logical hierarchical structure.

31. A method of generating a data capture definition file for defining data elements required from a user during a data capture process, comprising the steps of:

20 receiving as input a specification of data elements required during data capture, each data element having a type specification, and a logical relationship relative to other data elements in a hierarchical structure, said type specifications and said hierarchical structure being usable for automatically determining a physical layout of visual displays for presentation to a user during a subsequent data capture process;

25 associating, with said data elements, a set of data validation requirements for validating data captured in respect of each of the data elements;

30 associating, with said data elements, a set of rules for execution during a subsequent data capture process, for further enabling automatic

determination of a physical layout of the visual displays to be presented to a user during said subsequent data capture process based on values of data captured during said data capture process;

5 generating said data capture definition file providing said specification of data elements, said hierarchical structure, said data validation requirements and said set of rules in a predetermined format for subsequent execution by a data capture process.

32. A method of generating an electronic form for 10 presentation to a user during a data capture process, comprising the steps of:

receiving as input a data capture definition file in a predetermined format providing a specification of data elements required during data capture, each data element having a type specification and a logical relationship relative to other data elements in a hierarchical structure;

15 automatically generating a plurality of visual displays for presentation to the user, each visual display including a plurality of user input areas and user prompts relating thereto corresponding to the data elements, each being physically positioned on the displays in a manner corresponding to the defined logical hierarchical structure.

20

33. A computer program product, comprising a computer readable medium having thereon computer program code means adapted, when said program is loaded onto a computer, to make the computer execute the procedure of any one of claims 30 to 32

25

34. A computer program, distributable by electronic data transmission, comprising computer program code means adapted, when said program is loaded onto a computer, to make the computer execute the procedure of any one of claims 30 to 32.

30

35. Apparatus substantially as described herein with reference to the accompanying drawings.

Figure 1

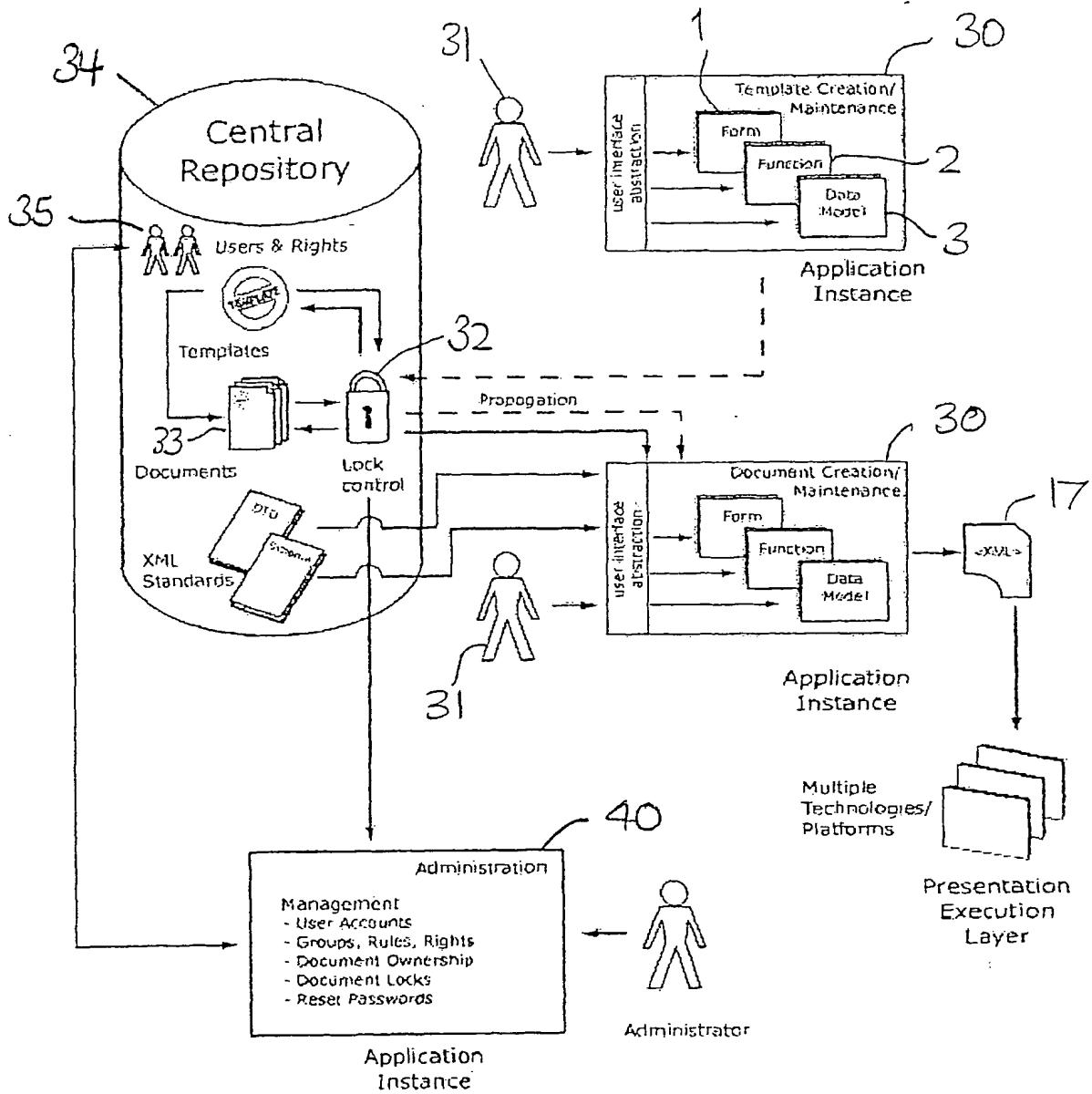


Figure 2

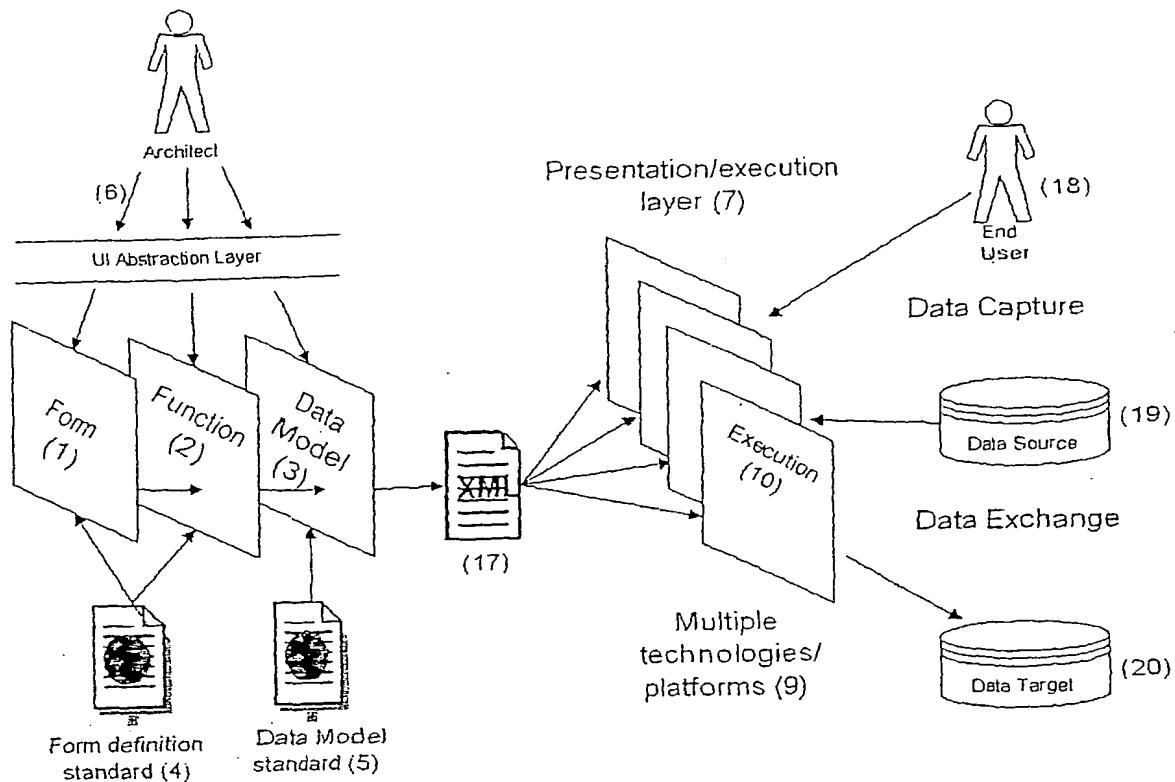


Figure 3

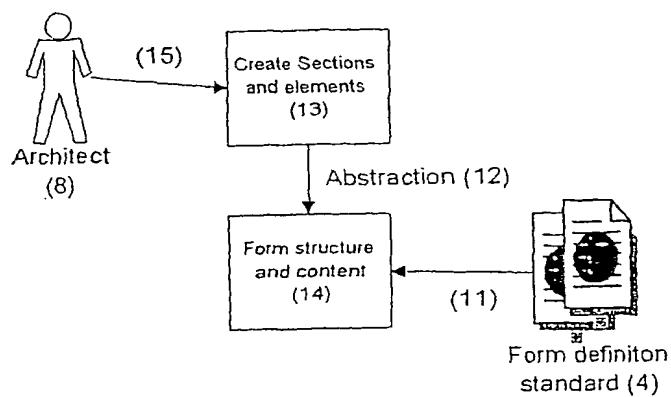


Figure 4

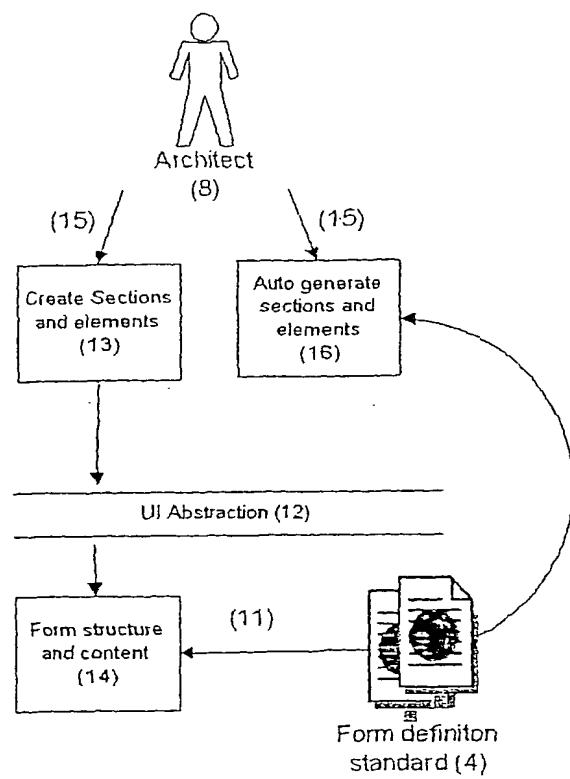


Figure 5

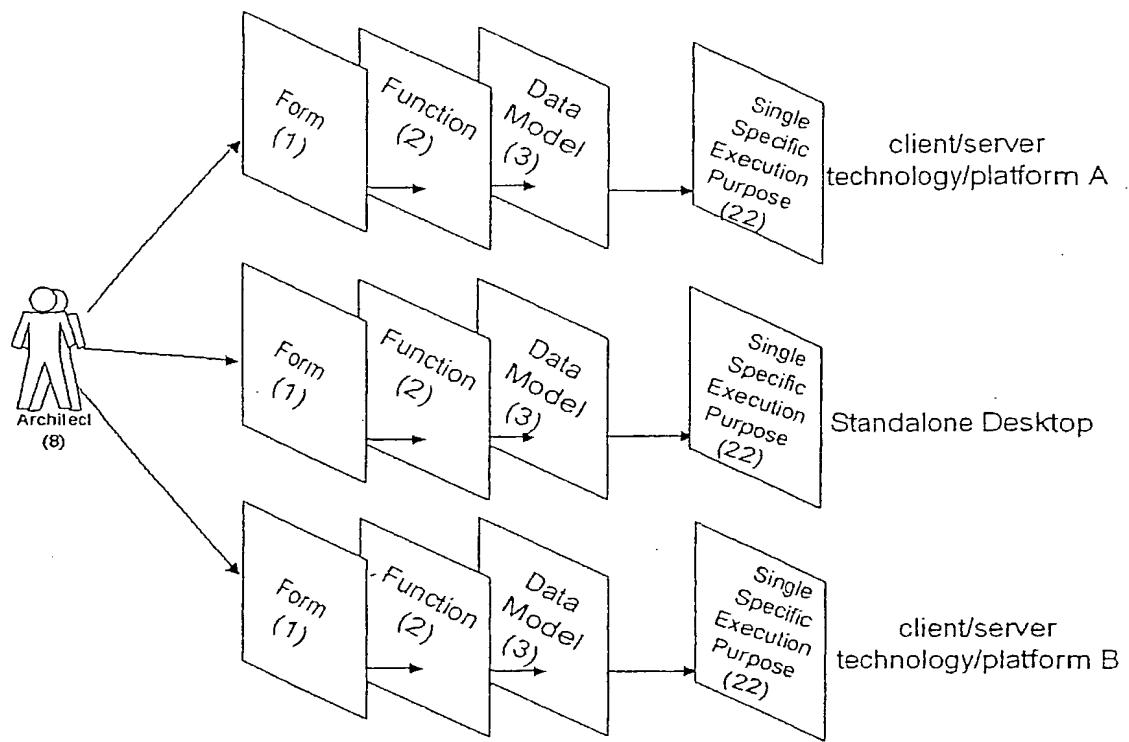


Figure 6

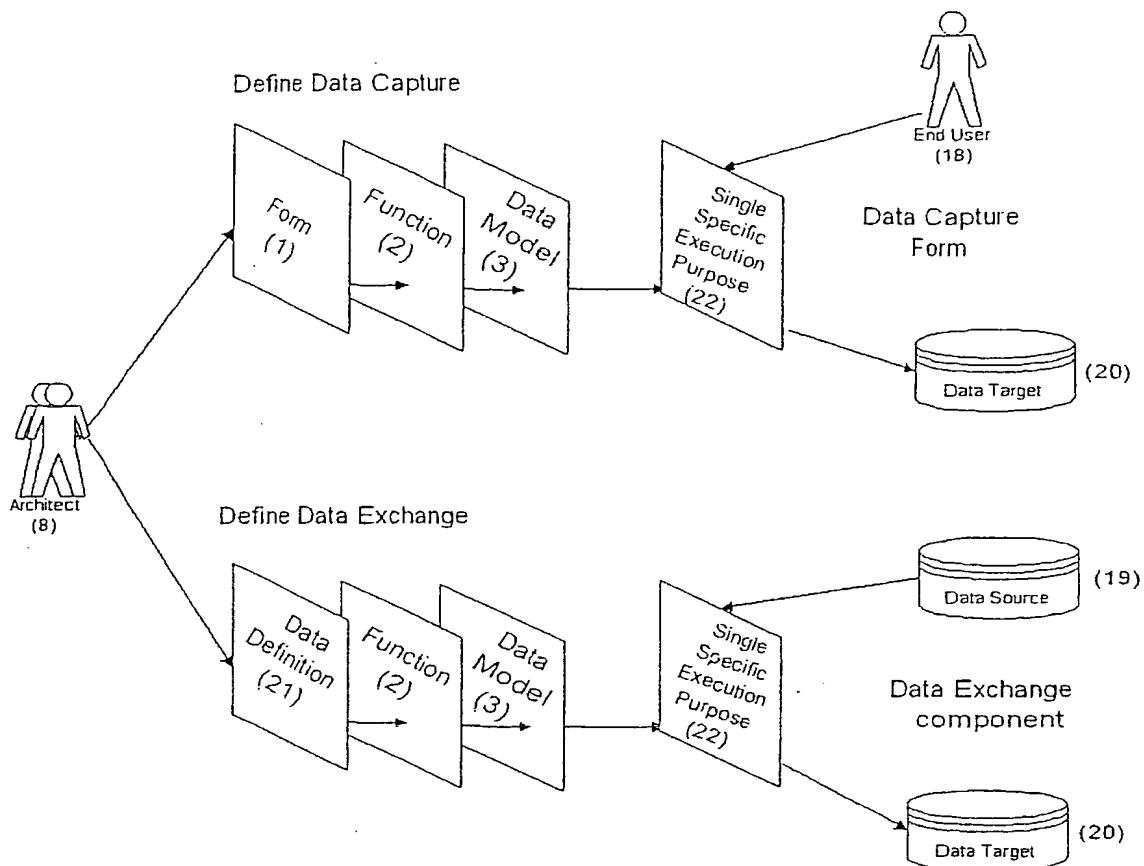
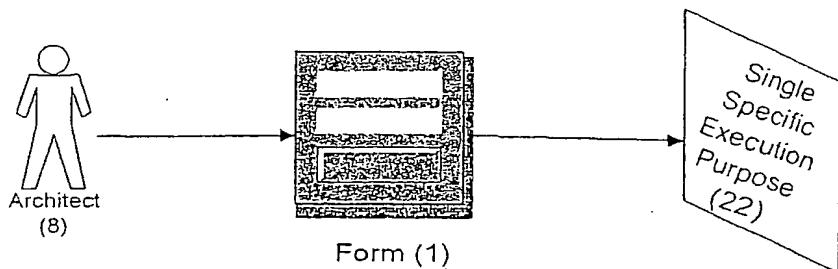


Figure 7



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PCT/GB03/02180

Figure 8

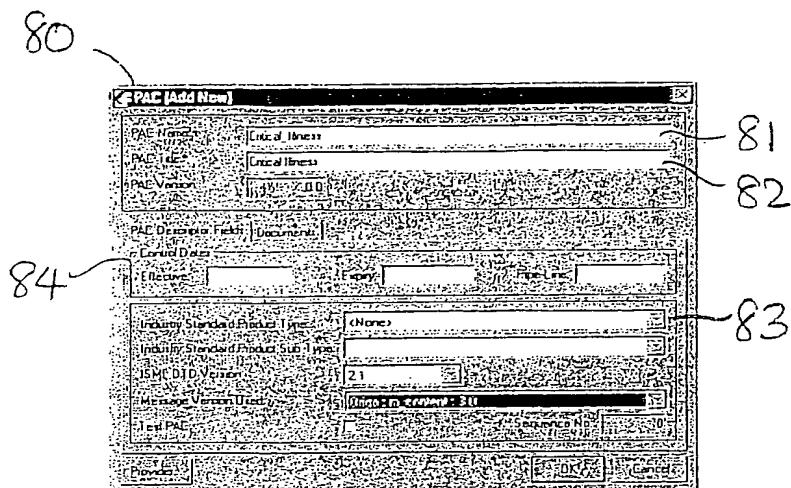
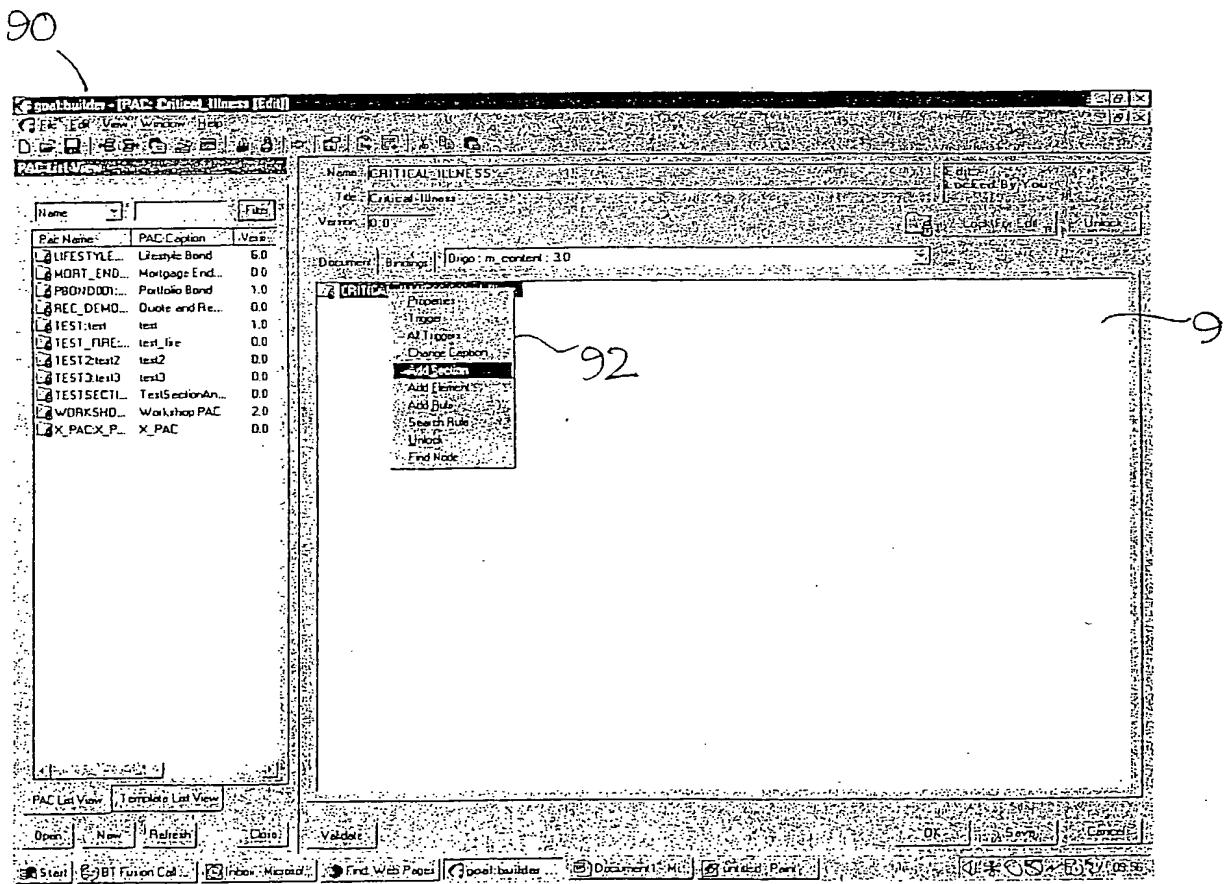


Figure 9



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Figure 10

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<p><b>PAC List View</b> <b>Template View</b></p> <p><b>Open</b> <b>New</b> <b>Recent</b> <b>Close</b></p>	<p><b>Name</b> <b>PAE</b> <b>Staff</b></p> <p><b>PAE Name</b> PAE <b>PAE Backup</b> PAE</p> <p><b>PAE CRITICAL_I</b> Critical_Interest 0.00  <b>PAE CRITICAL_L</b> Critical_Interest 0.00  <b>PAE LIFESTYLE_L</b> Lifestyle_Bond 6.00  <b>PAE MORT_END_L</b> Mortgage_End_ 0.00  <b>PAE PBOBOND_L</b> Portable_Bond 1.00  <b>PAE REC_DEMO_L</b> Quote_and_Re_ 0.00  <b>PAE TEST_I</b> test1 1.00  <b>PAE TEST1_FIRE_I</b> test1_fir 0.00  <b>PAE TEST1_end2_I</b> test2 0.00  <b>PAE TEST3_end3_I</b> test3 0.00  <b>PAE TESTSECTIONAN_I</b> TestSectionAn 0.00  <b>PAE WORKSHOP_I</b> Workshop_PAC 2.00</p>	<p><b>Name</b> CRITICAL_ILLNESS <b>PAE CRITICAL_I</b> Critical_Interest 0.00  <b>PAE CRITICAL_L</b> Critical_Interest 0.00  <b>PAE LIFESTYLE_L</b> Lifestyle_Bond 6.00  <b>PAE MORT_END_L</b> Mortgage_End_ 0.00  <b>PAE PBOBOND_L</b> Portable_Bond 1.00  <b>PAE REC_DEMO_L</b> Quote_and_Re_ 0.00  <b>PAE TEST_I</b> test1 1.00  <b>PAE TEST1_FIRE_I</b> test1_fir 0.00  <b>PAE TEST1_end2_I</b> test2 0.00  <b>PAE TEST3_end3_I</b> test3 0.00  <b>PAE TESTSECTIONAN_I</b> TestSectionAn 0.00  <b>PAE WORKSHOP_I</b> Workshop_PAC 2.00</p> <p><b>Document</b> <b>Branch</b> <b>Diagnose content</b>: 30</p> <p><b>CRITICAL_ILLNESS:Critical_Interest</b></p> <p><b>NUMBER_APP:</b> Number of Applicants <b>102</b></p> <p><b>PERSONAL_DETAILS_1:First_Applicant</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> E_BD1_1:file</li> <li><input checked="" type="checkbox"/> E_BD2_Forenames</li> <li><input checked="" type="checkbox"/> E_BD3_Surname</li> <li><input checked="" type="checkbox"/> E_BD4_Date_of_Birth <b>103</b></li> <li><input checked="" type="checkbox"/> E_OCD2_Capitalisation</li> <li><input checked="" type="checkbox"/> E_ROUTE1_EMP_STATUS_1:Employment_Status</li> <li><input checked="" type="checkbox"/> E_EMPDE1_CINB_1:Employee's_Business</li> </ul> <p><b>PERSONAL_DETAILS_1:Second_Applicant</b></p> <p><b>ADDRESS_MORT_PROP:</b> Address of the Mortgaged Property</p> <p><b>CORRESPONDENCE_ADDRESS:</b> Correspondence Address</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> SAME_AS_Same_as_Mortgaged_Property</li> <li><input checked="" type="checkbox"/> ADDRESS_1_1:Address</li> <li><input checked="" type="checkbox"/> ADDRESS_2_1:two_captions</li> <li><input checked="" type="checkbox"/> ADD_3:no_captions</li> <li><input checked="" type="checkbox"/> ADDRESS_3_1:Town/City</li> <li><input checked="" type="checkbox"/> ADDRESS_4_1:Postcode</li> </ul> <p><b>TYPE_OF_COVER:</b> Type of Cover Required</p> <p><b>MONTHLY_BENEFIT:</b> Monthly Benefit <b>104</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> FIRST_APP:First_Applicant</li> <li><input checked="" type="checkbox"/> SECOND_APP_1:Second_Applicant</li> <li><input checked="" type="checkbox"/> TOTAL_BENEFIT:Total_Monthly_Benefit</li> </ul> <p><b>GENERALQUESTIONS:</b> General Questions</p> <p><b>INSTRUCTION_TO_BANK:</b> Instruction to your Bank or Building Society</p> <p><b>Rules for CRITICAL_ILLNESS</b></p>
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Figure 11

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Figure 12

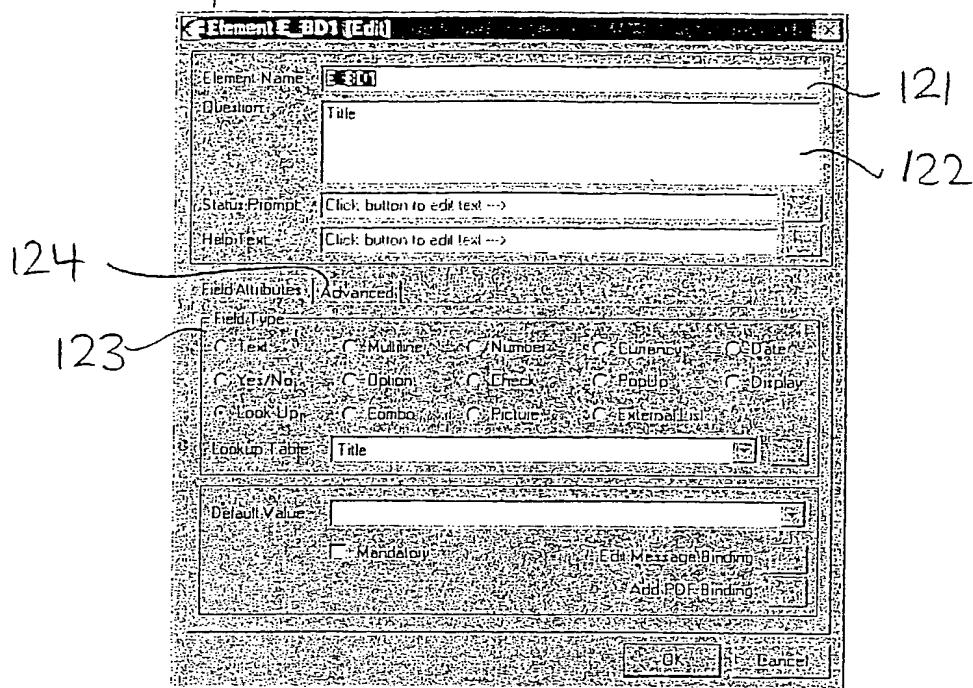
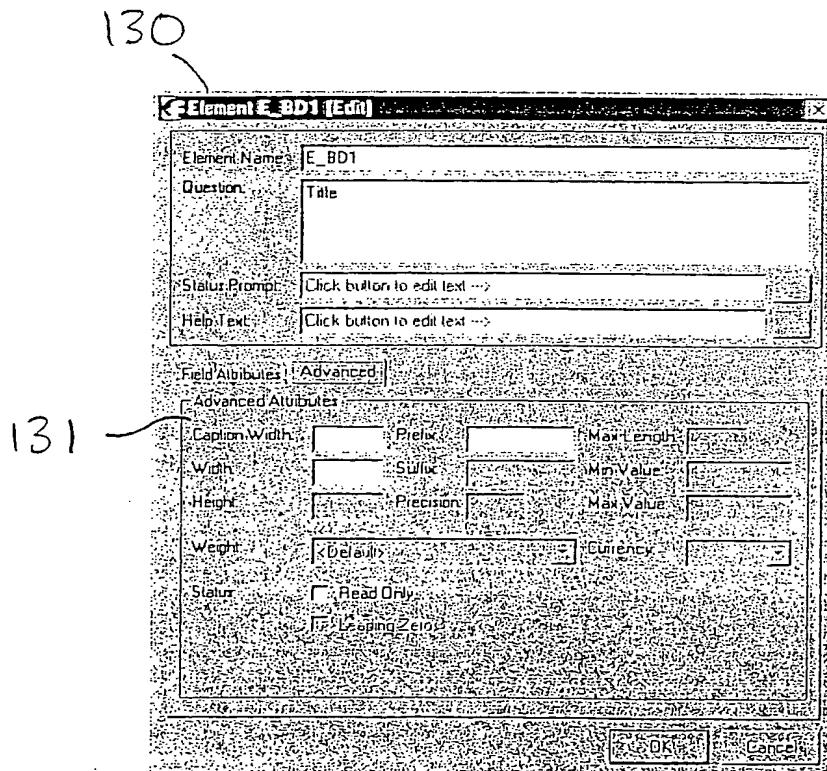


Figure 13



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Figure 14

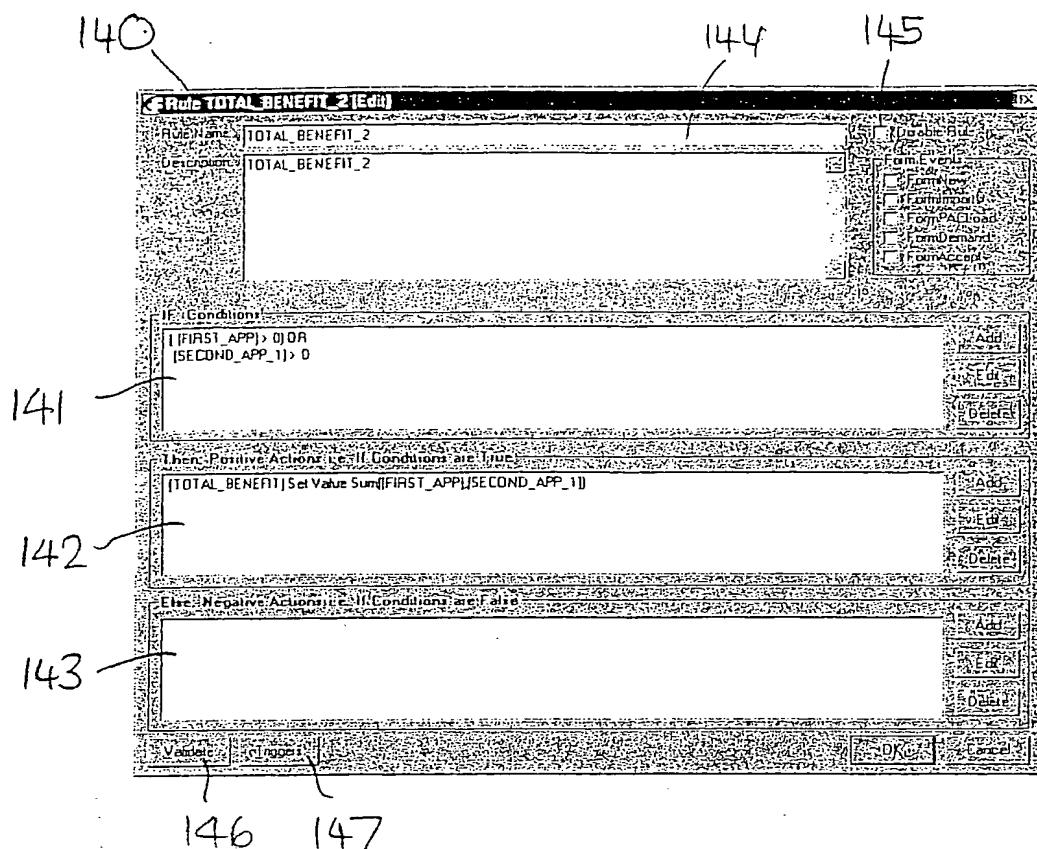


Figure 15

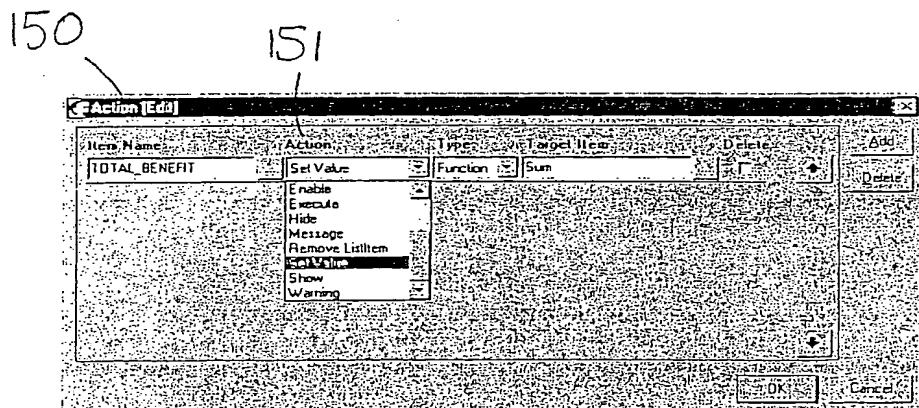
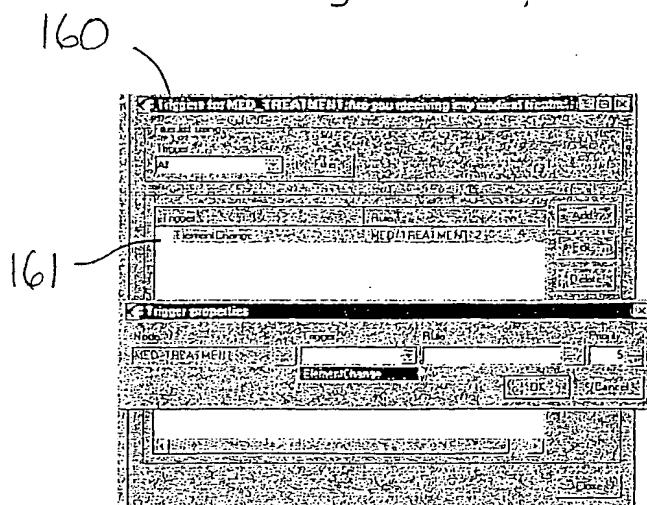


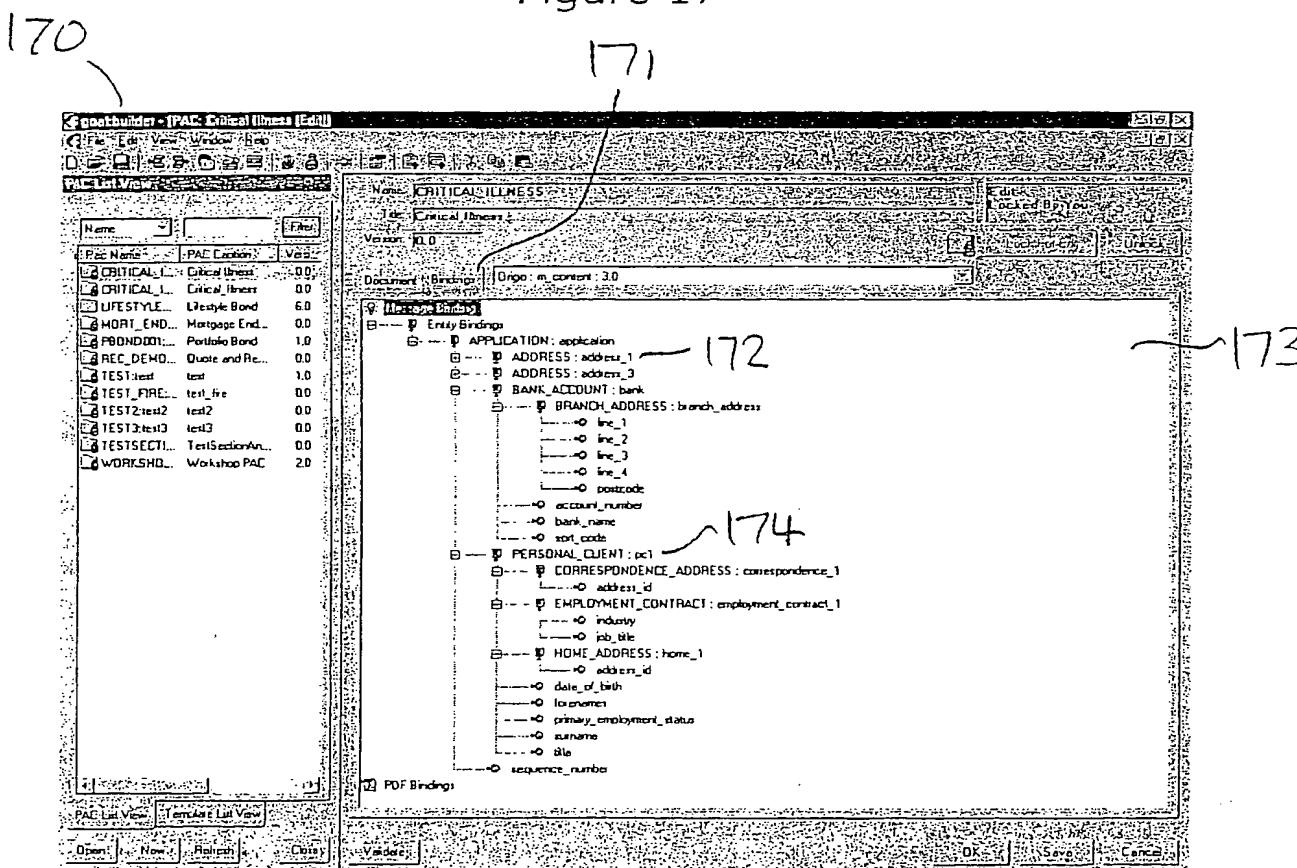
Figure 16



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Figure 17



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Figure 18

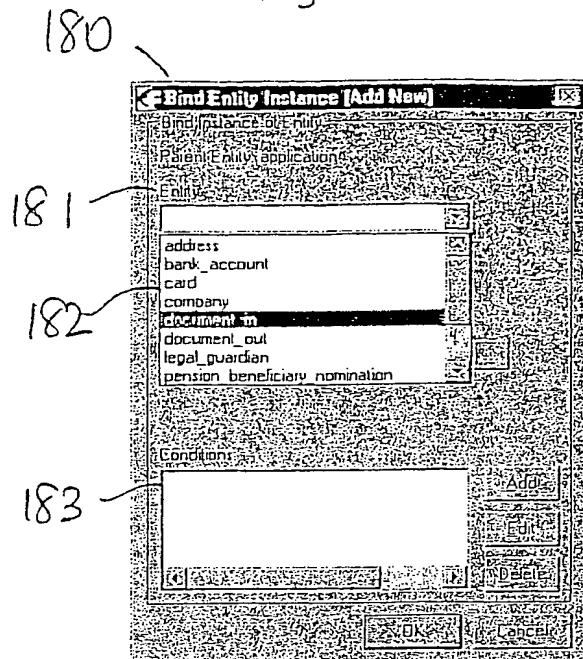


Figure 19

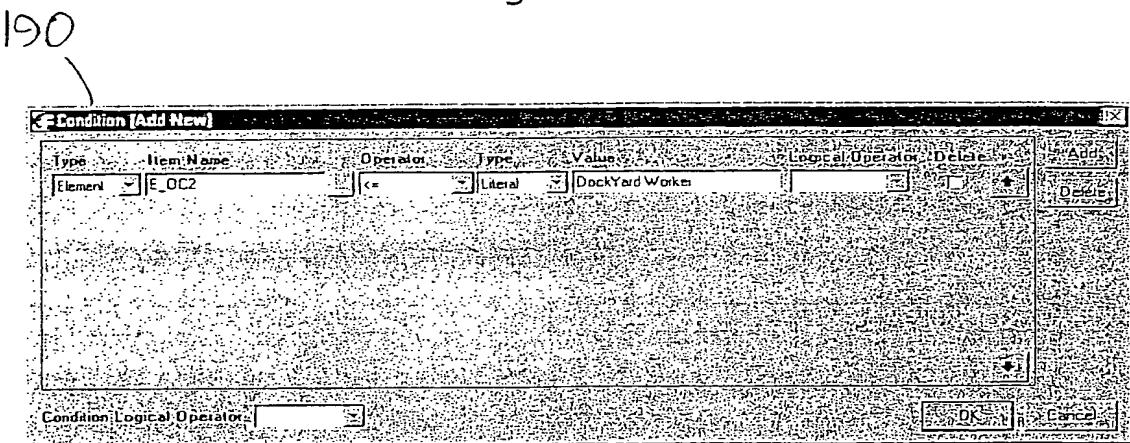


Figure 20

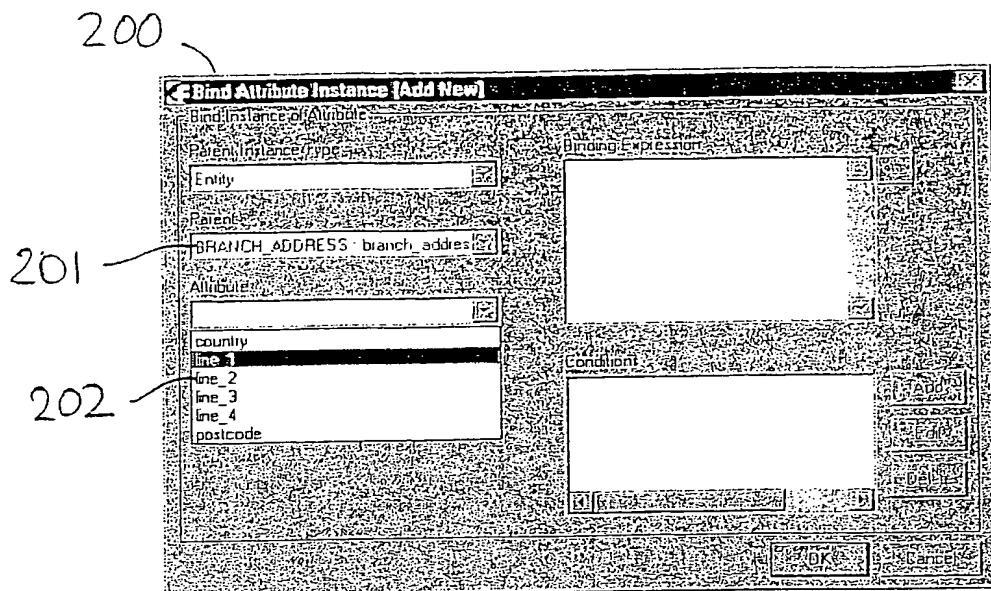


Figure 21

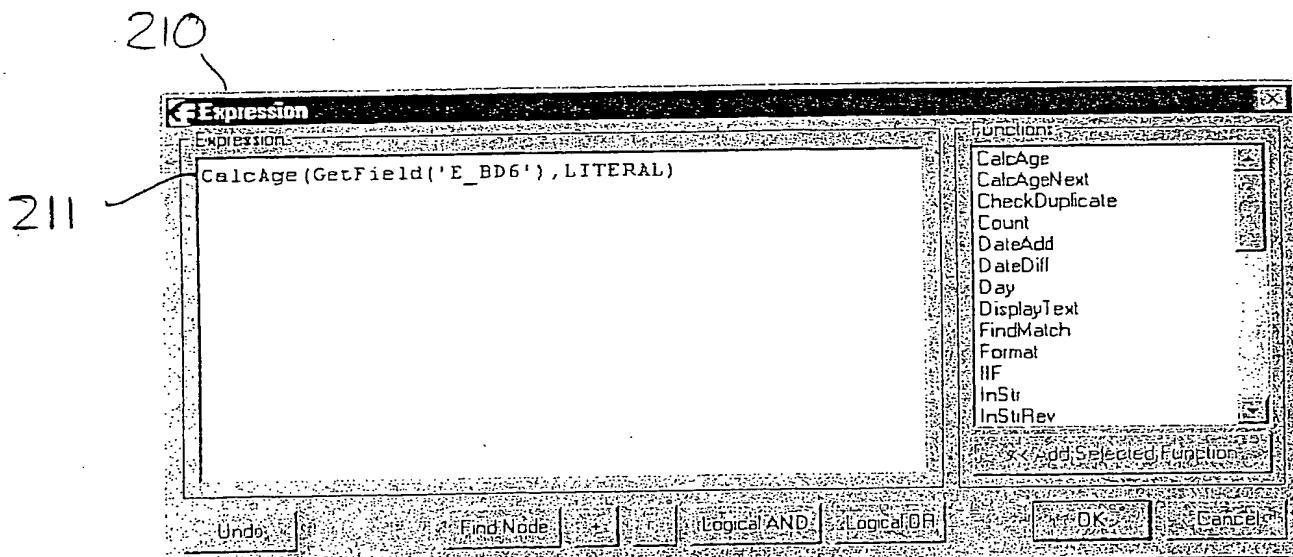
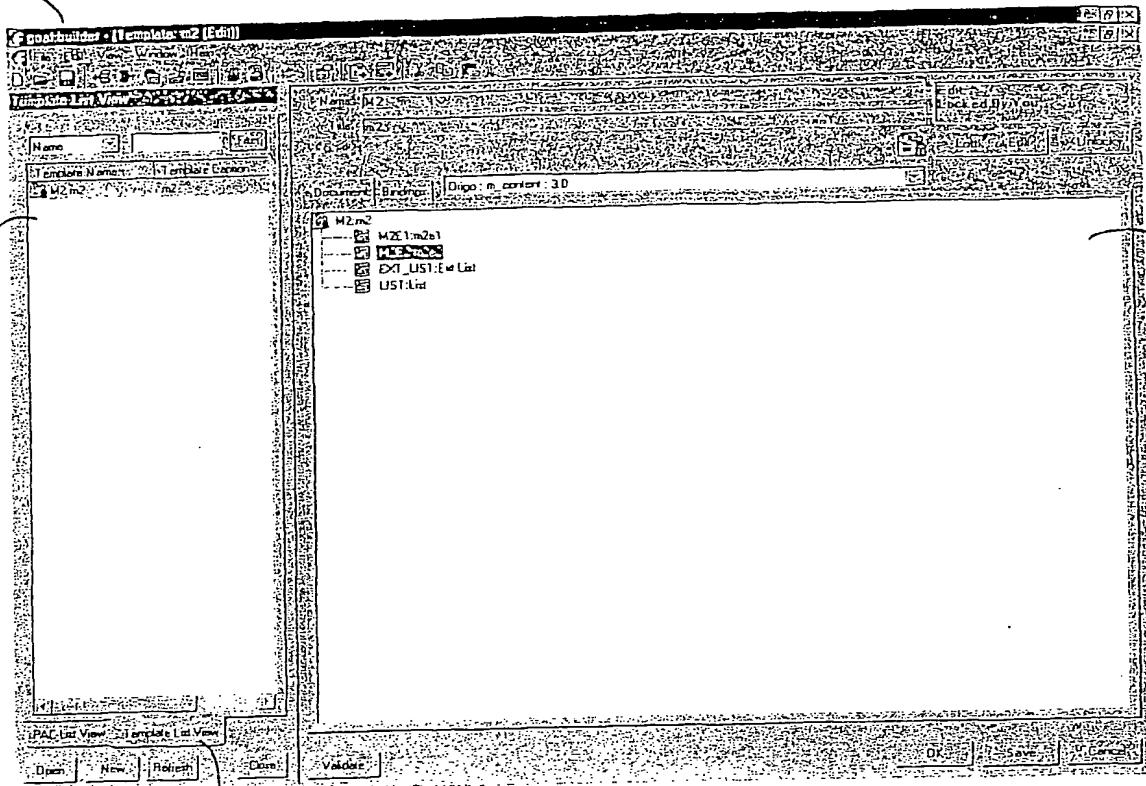


Figure 22

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Figure 23

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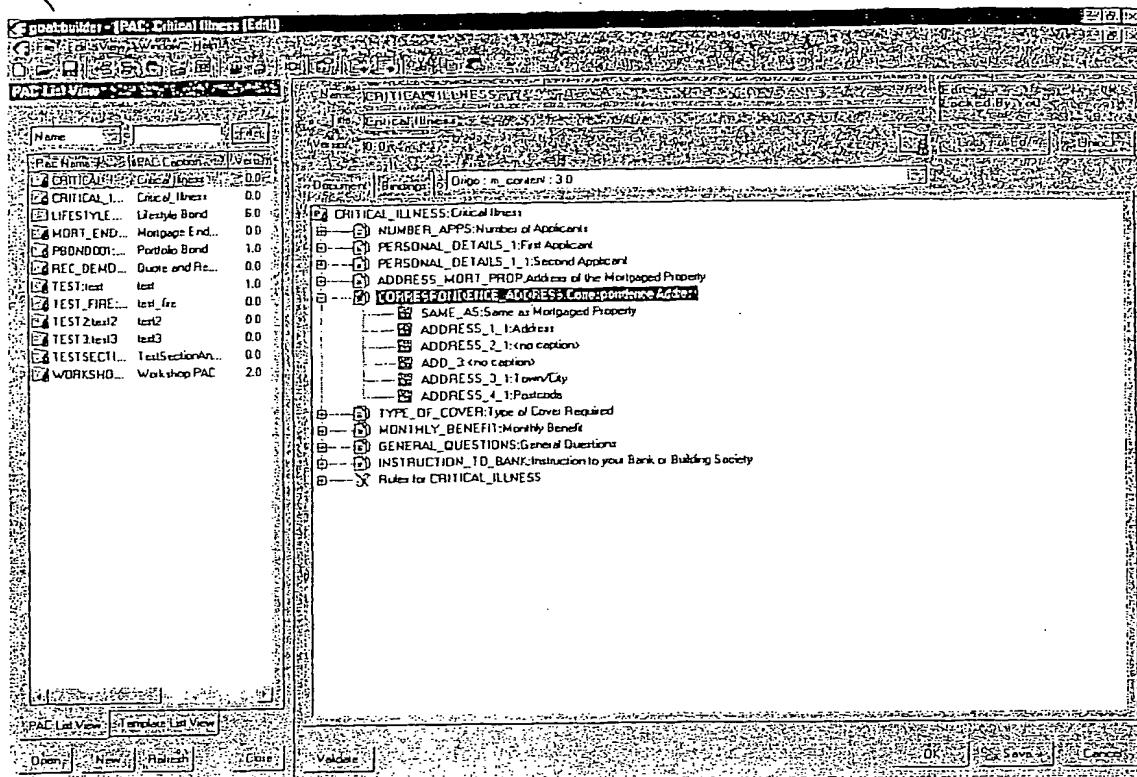


Figure 24

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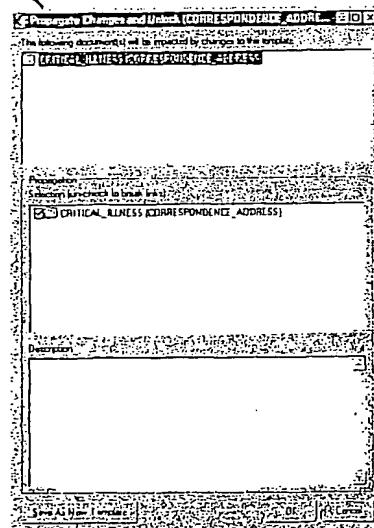


Figure 25

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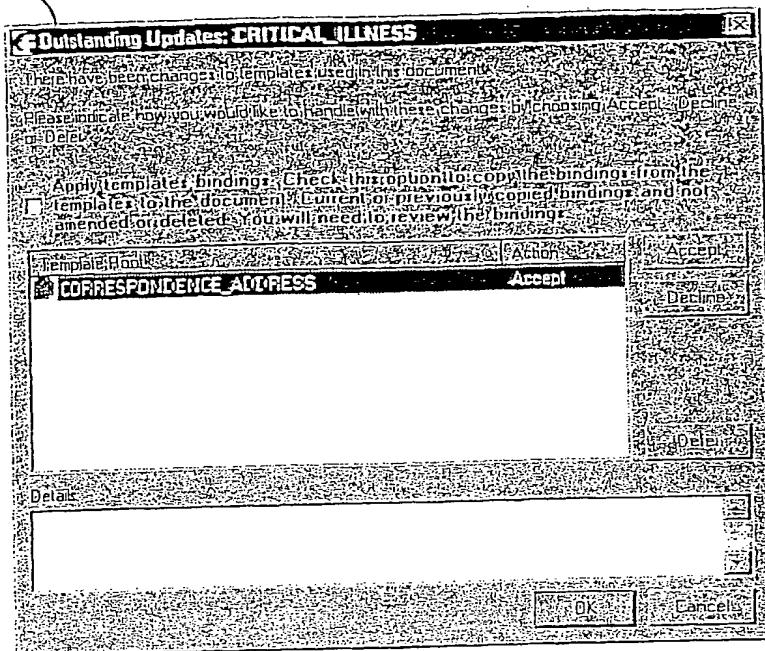


Figure 26

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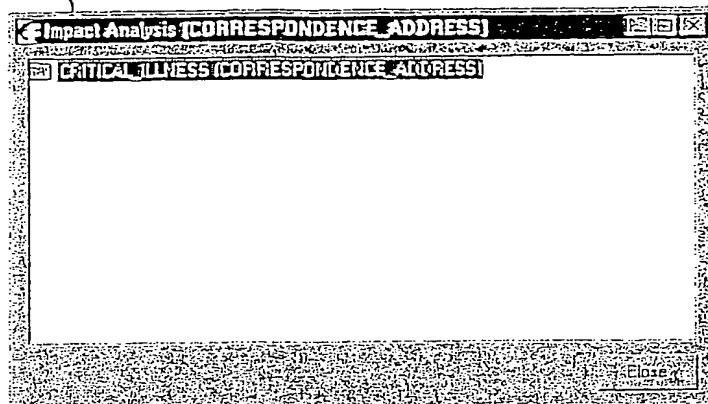


Figure 27

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 A screenshot of a software interface titled 'Customer - CRITICAL ILLNESS-Critical Illness'. The interface includes a left sidebar with a list of fields and their values, and a main panel for 'First Applicant' with various input fields. The fields in the sidebar include:
 

- Name: [ ]
- PAC Name: [ ]
- PAC E-mail: [ ]
- PAC Tel: [ ]
- CRITICAL\_1: Critical Illness: 0.00
- CRITICAL\_2: Critical Illness: 0.00
- LIFESTYLE: Lifestyle Bond: 0.00
- MORT\_END: Mortgage End: 0.00
- PROBOND: Portfolio Bond: 1.00
- REC\_DEMO: Domic and Re: 0.00
- TEST1: test: 1.00
- TEST\_FIRE: test\_fir: 0.00
- TEST2: test2: 0.00
- TEST3: test3: 0.00
- TESTSECTION: TestSectionAn: 0.00
- WORKSHOP: Workshop PAC: 2.00

 The main panel for 'First Applicant' contains sections for 'Critical Illness', 'First Applicant', 'Second Applicant', 'Address of the Mortgaged Prop.', 'Correspondence Address', 'Type of Cover Requested', 'Monthly Benefit', 'General Benefits', 'Instruction to your Bank or Build', 'Employment Status', and 'Employee's Business'. A dropdown menu for 'Occupation' lists:
 

- Cleaning Contractors Manager
- Cleaning Plant Operator
- Demolition
- Deco Staff
- Deco Worker
- Critical Worker - Oil Rig Industry

 A dropdown menu for 'Employment Status' shows 'Employed'. At the bottom of the panel are buttons for 'Data Options' and 'Refresh'.

Figure 28

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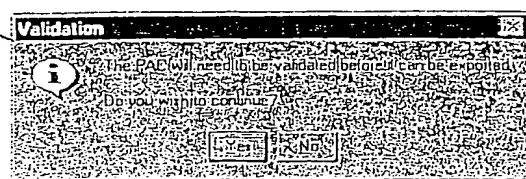


Figure 29

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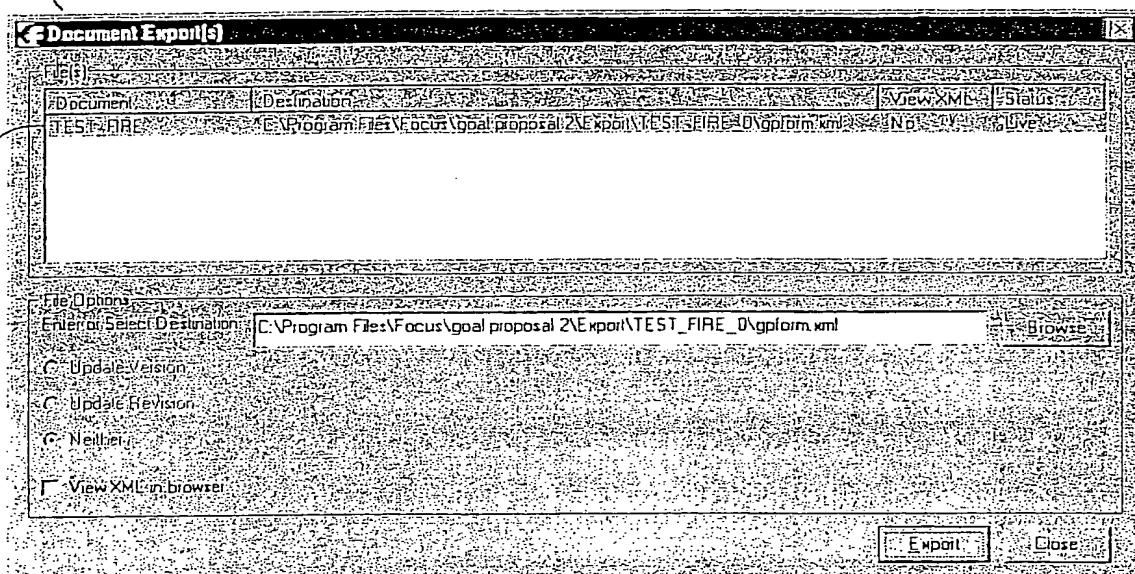


Figure 30

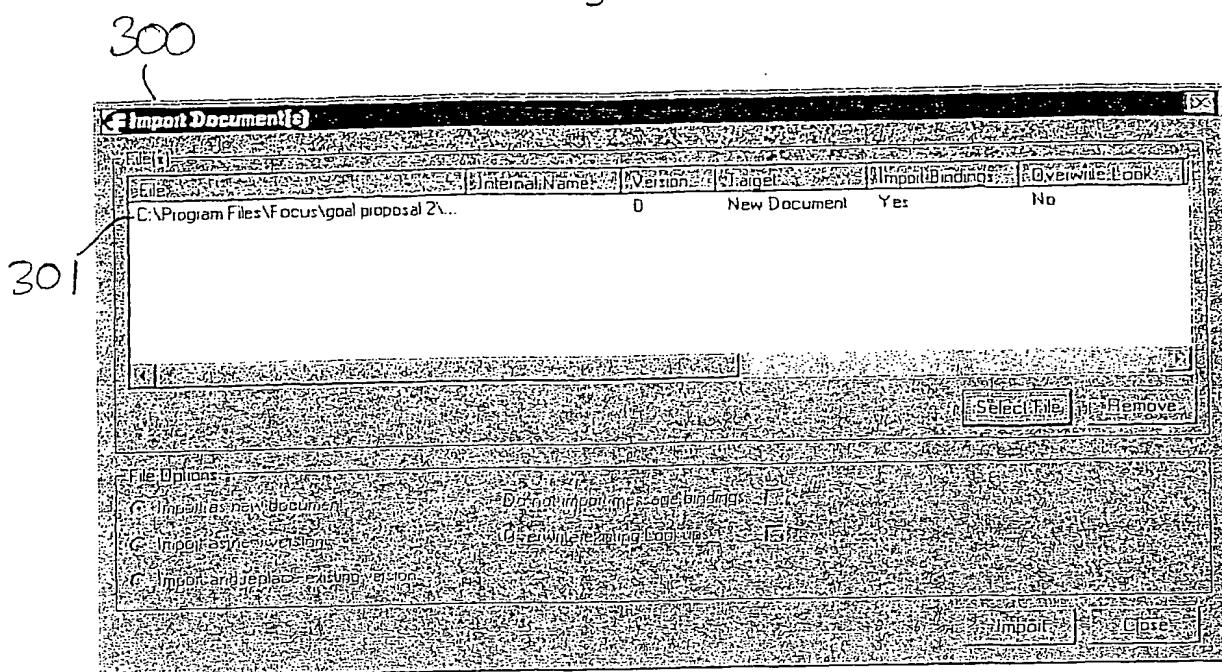


Figure 31

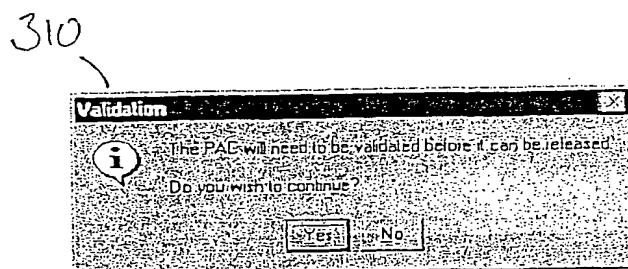
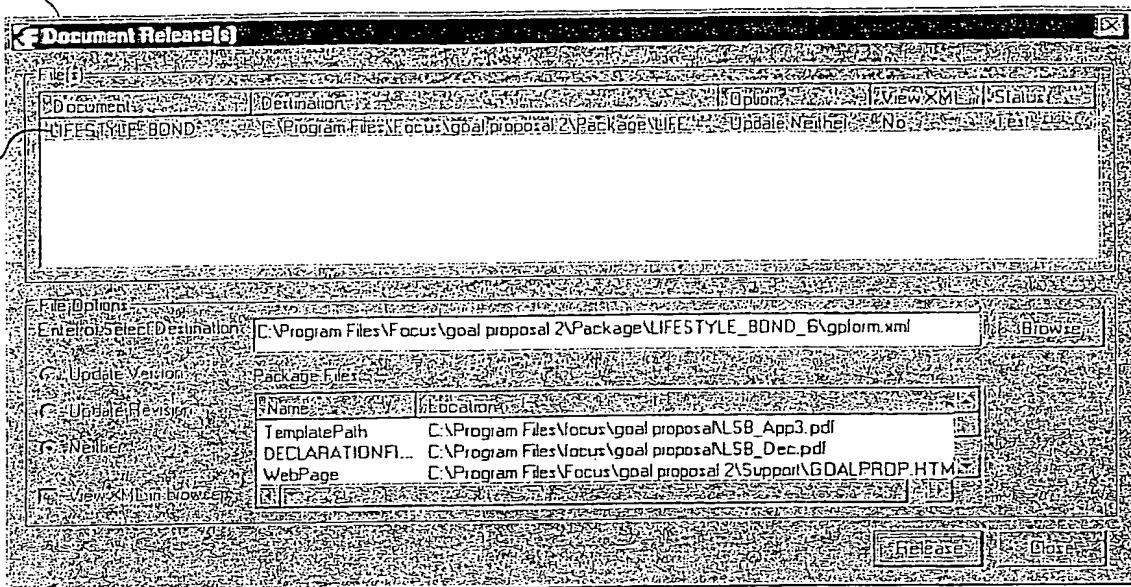


Figure 32

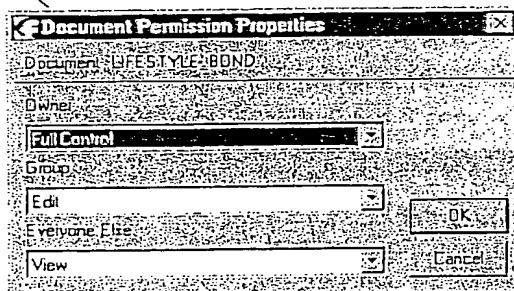
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Figure 33

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Figure 34

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Nodes	Action
FIRST_APP	ElementChange
FIXED_CONTRACT	ElementChange
GENERAL_QUESTIONS	SectionEnter
IMP_TREATMENT	ElementChange
IMPEND_UNEMPLOY	ElementChange

Figure 35

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Rule Name	Description	Is Used	Document	Add
A_S_ONLY_1	A_S_ONLY_1	Yes	CRITICAL	Edit
A_S_U_1	A_S_U_1	Yes	CRITICAL	Edit
FAMILY_HOME_1	FAMILY_HOME_2	Yes	CRITICAL	Edit
FIXED_CONTRACT_1	FIXED_CONTRACT_2	Yes	CRITICAL	Edit
HIDE_FAMILY_1	HIDE_FAMILY_HOME_1	Yes	CRITICAL	Edit
HIDE_FIXED_1	HIDE_FIXED_CONTRACT_1	Yes	CRITICAL	Edit
HIDE_IMP_TREAT_1	HIDE_IMP_TREAT_2	Yes	CRITICAL	Edit
HIDE_IMPEN_UNEMPLOY_1	HIDE_IMPEN_UNEMPLOY_2	Yes	CRITICAL	Edit
HIDE_MED_TREAT_1	HIDE_MED_TREAT_2	Yes	CRITICAL	Edit
HIDE_MORT_PAY_1	HIDE_MORT_PAY_2	Yes	CRITICAL	Edit

Figure 36

360

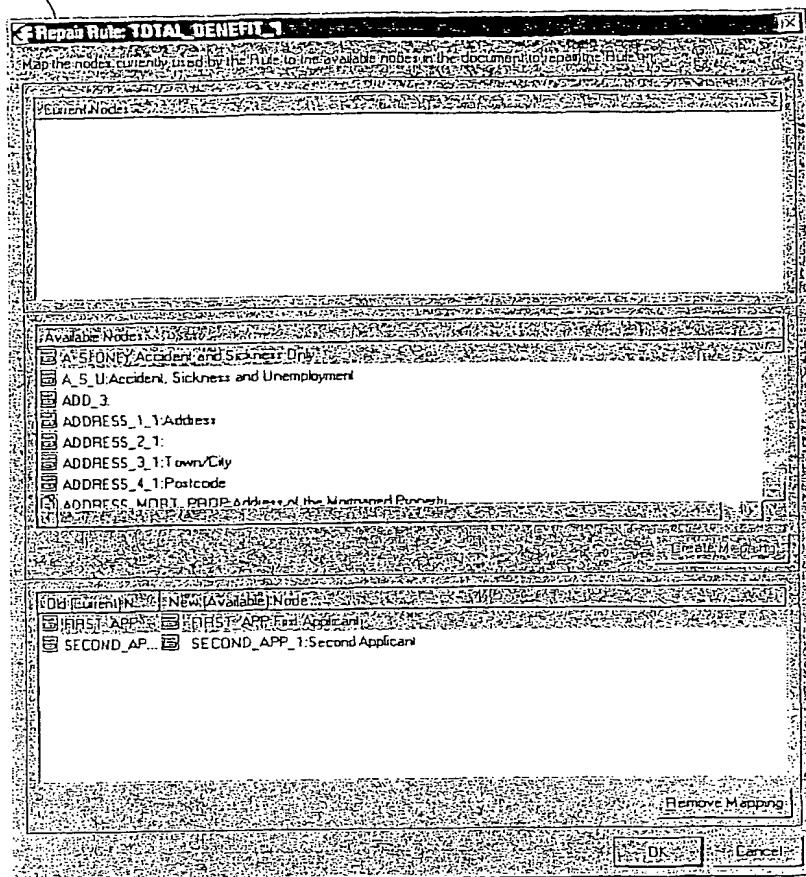


Figure 37

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CRITICAL ILLNESS Critical Illness

Number of Applicants

First Applicant

Second Applicant

Address of the Mortgaged Property

Correspondence Address

Type of Cover Required

Monthly Benefit

General Questions

Instruction to your Bank or Building Society

Date Options Refresh Print

Figure 38

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Figure 39

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Figure 40

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goal:viewer[11.04.0026] - Critical illness [my\_prov\_name] - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Help

Address: ① http://127.0.0.1:333/web/test55/homeSet.htm

Number of Applicants: 1

First Applicant

First Applicant

Second Applicant

Address of the  
Mortgaged Property

Correspondence  
Address

Type of Credit  
Required

Monthly Benefit

General Questions

Instruction to your  
Bank or Building  
Society

First Name: Mr 391

Middle Name: 391

Forenames: Steven John 392

Surname: Brown 393

Date of Birth: 12/1/1970 394

Choose 394

Occupation: Accountant 395

Employment Status: 396

Employer's Business: Enclosed  
Self Employed  
Retired  
Not Employed 396

To-do List: Save Save and Print Validate & Accept Cancel & Exit

Figure 41

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**General Questions**

**Section**

**1. Critical Illness**

- Number of Applicants
- First Applicant
- Second Applicant
- Address of the Mortgaged Property
- Correspondence Address
- Type of Cover Required
- Monthly Benefit
- General Questions
- Instruction to your Bank or Building Society

**2. General Questions**

Do you receive any medical treatment?  No  Yes

Do you know of any impending treatment?  No  Yes

Have you suffered from any illness in the last 12 months?  No  Yes

Is the property to be used for any purpose other than your own family home?  No  Yes

Do you permanently live outside the United Kingdom?  No  Yes

Do you work less than 16 hours per week?  No  Yes

Do you know of any impending unemployment?  No  Yes

Are you on a fixed term contract?  No  Yes

Have you failed to pay a monthly mortgage repayment in the last 12 months?  No  Yes

**Data Options**  Refresh  Rebuild  Close

10/516896

WO 03/105022

PCT/GB03/02180

Figure 42

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Figure 43

goal-viewer (114.112.25) : Critical Illness (my\_pivot\_name) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Stop Refresh Home Search Favorites Help

Address: 2) http://127.0.0.1:8080/web/let05/lineSel.html

Number of Applicants: 1

First Applicant:

Second Applicant:

Address of the Mortaged Property:

Correspondence Address:

Type of Cover Required:

Monthly Benefits:

General Questions:

Instruction to your Bank or Building Society:

General Questions

Are you receiving any medical treatment?  Yes  No

Do you know of any impending treatment?  Yes  No

Have you suffered from any illness in the last 12 months?  Yes  No

Is the property to be used for any purpose other than your or your family home?  Yes  No

Do you permanently live outside the United Kingdom?  Yes  No

Do you work less than 16 hours per week?  Yes  No

Save   Save and Print  Validate & Accept  Cancel & Exit

Done

10/516898

WO 03/105022

PCT/GB03/02180

Figure 44

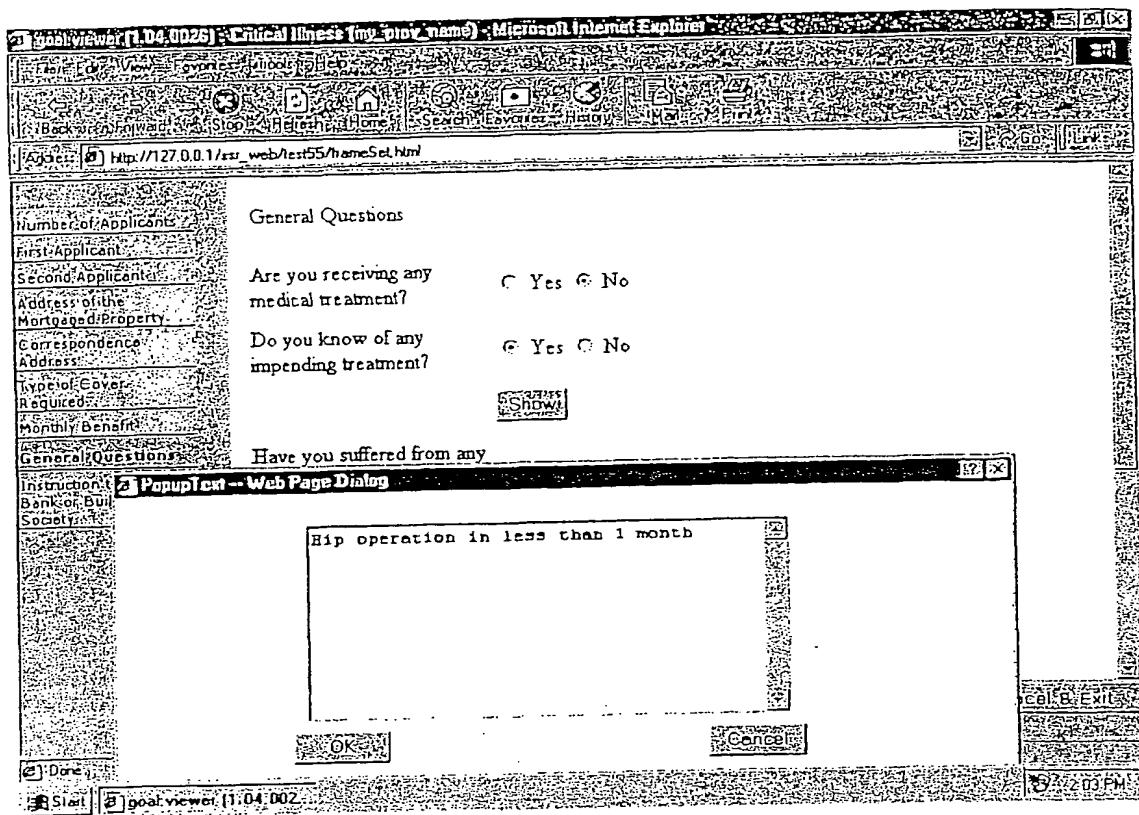


Figure 45

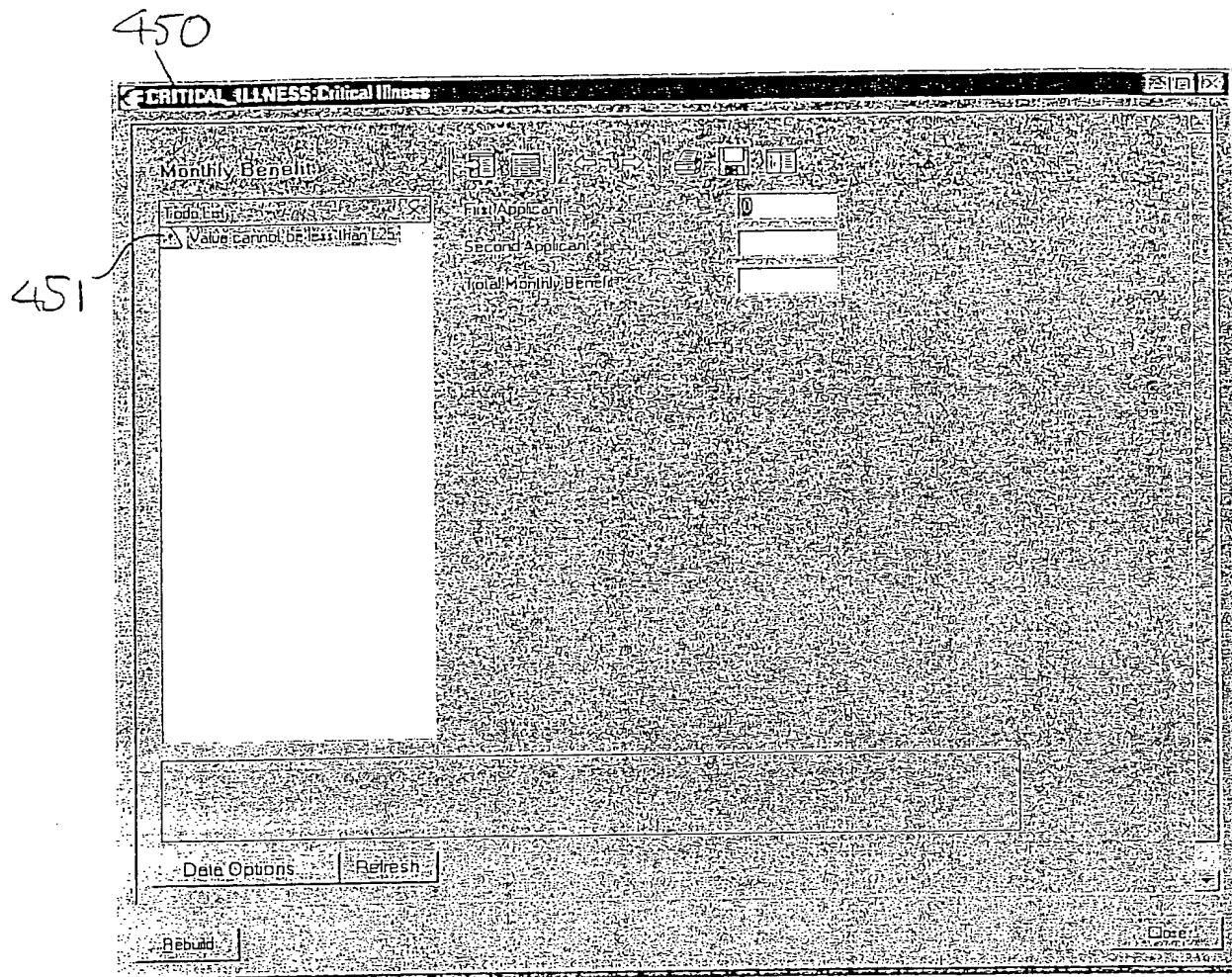


Figure 46

460

**Critical Illness Section**

**Instruction to your Bank or Building Society**

**Section 1**

**Critical Illness**

- Number of Applicants
- First Applicant
- Second Applicant
- Address of the Mortgaged Property
- Correspondence Address
- Type of Cover Required
- Monthly Benefit
- General Questions
- Instruction to your Bank or Building Society

Name of your Bank or Building Society:  HSBC

Address:  11 High Street

Postcode:  Wrinchlow

County:  Oxfordshire

Postcode:  DV124EE

Name of Account Holder:  Steven John Brown

Name of Account Holder:

Account Number:  788686876

Sort Code:  78

**Critical Illness**

Information has been validated successfully.

Do you want to continue now?

Yes  No

Date Options Refresh

Rebuild

461

Figure 47

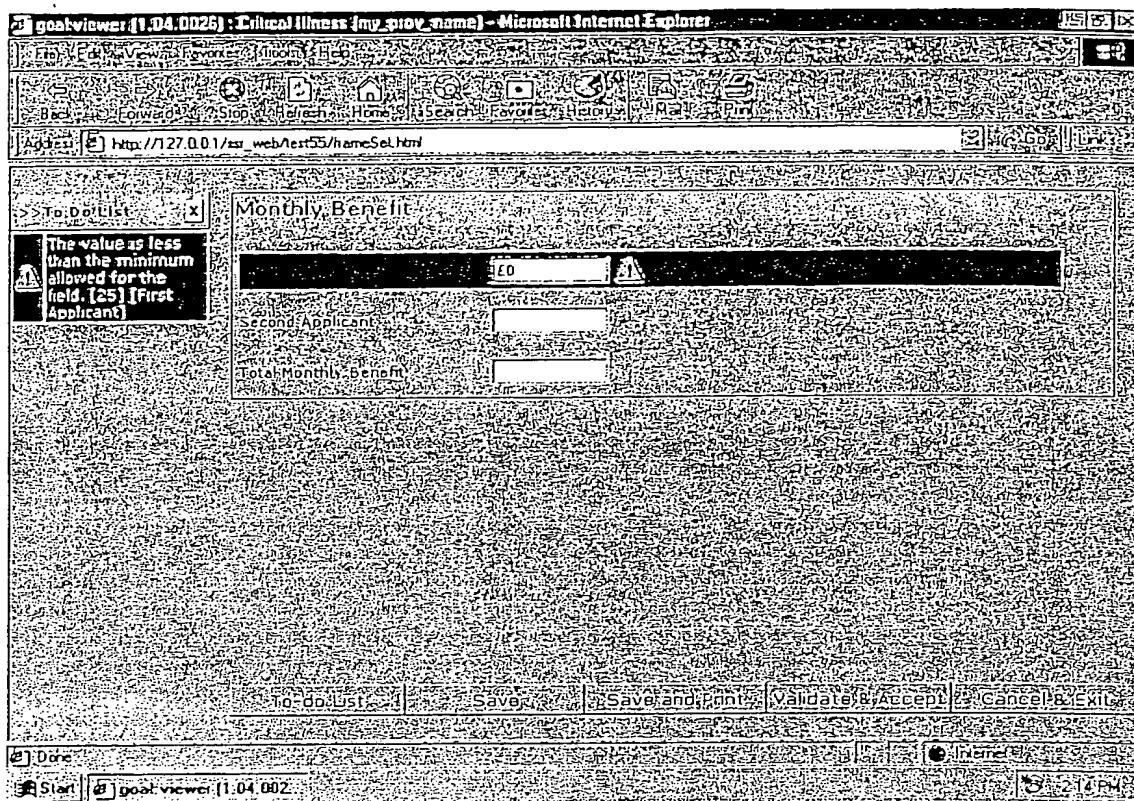
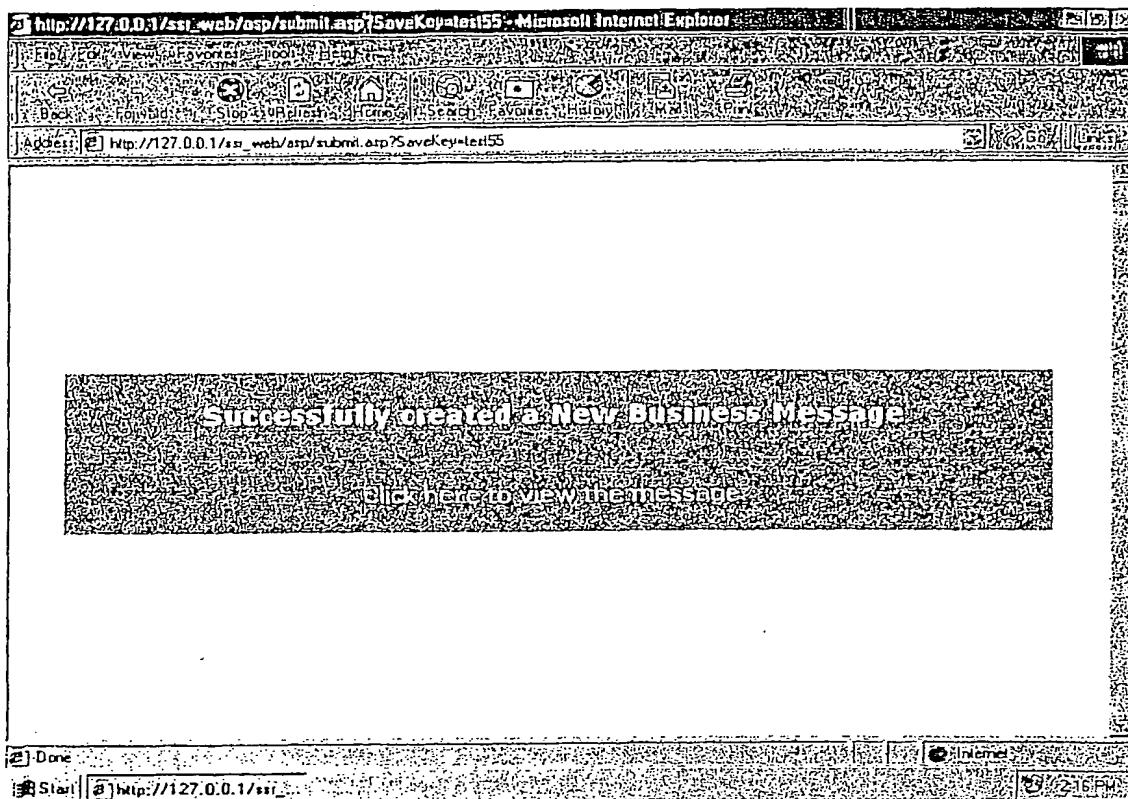


Figure 48



# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
 ERIC POTTER & CLARKSON  
 Attn. Charig, Raymond  
 Park View House  
 58 The Ropewalk  
 Nottingham NG1 5DD  
 UNITED KINGDOM

RECORDS	SEARCHED
2 JAN 2004	
PARTNER	ACTIONED

# PCT

## NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference  FOCU/ P28000PC	Date of mailing (day/month/year)  05/01/2004
International application No.  PCT / GB 03 / 02180	FOR FURTHER ACTION      See paragraphs 1 and 4 below  International filing date (day/month/year)  20/05/2003
Applicant  FOCUS SOLUTIONS GROUP PLC	

1.  The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
 34, chemin des Colombettes  
 1211 Geneva 20, Switzerland  
 Facsimile No.: (41-22) 740.14.35

or 16 Mo[lp]

For more detailed instructions, see the notes on the accompanying sheet.

2.  The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3.  With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer
--	--------------------

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

#### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

**The following examples illustrate the manner in which amendments must be explained in the accompanying letter:**

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers;  
claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended  
claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### **"Statement under article 19(1)" (Rule 46.4)**

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

**It must be in the language in which the international application is to be published.**

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### **Consequence if a demand for International preliminary examination has already been filed**

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

### **Consequence with regard to translation of the International application for entry into the national phase**

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

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